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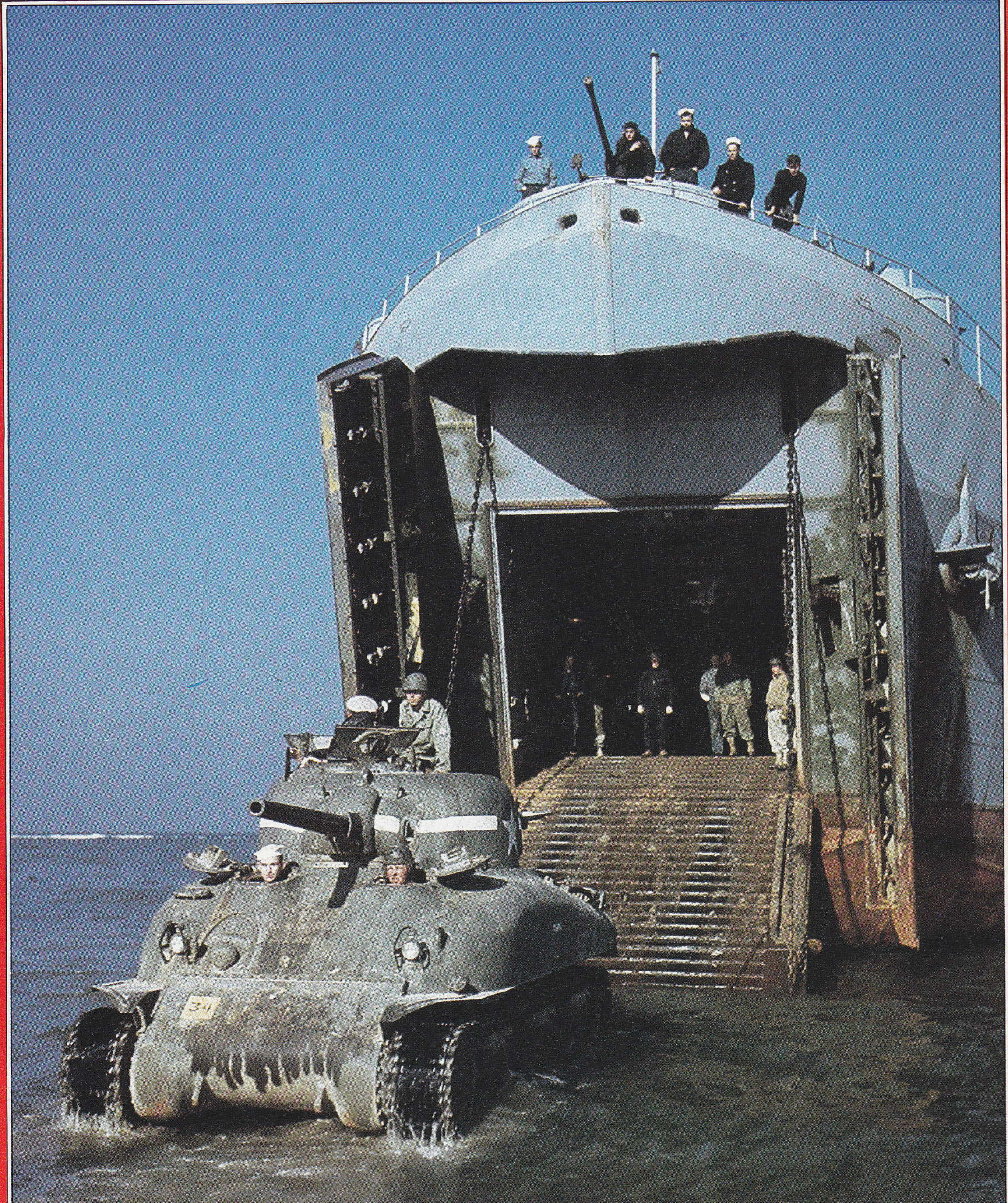

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WAR MACHINE

Volume 11 **Issue 121**

Published by
Orbis Publishing Ltd
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Colour Origination: Imago Publishing Ltd, Thame, Oxon

Typesetting: SX Composing Ltd

Film work: Precise Litho Ltd

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268512

Printed in Great Britain
by The Color Factory

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WAR MACHINE

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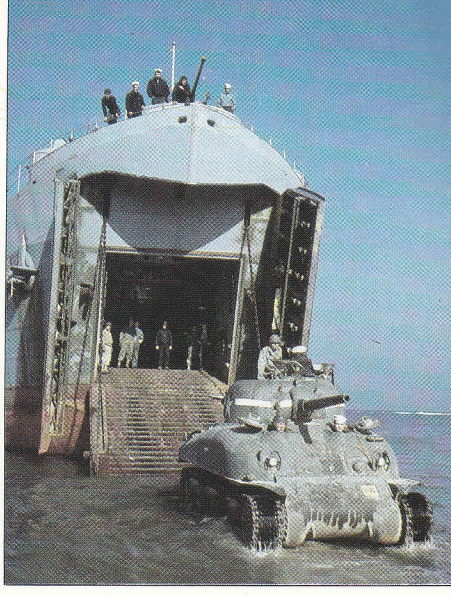
Assault Ships of World War 11



An American M4 medium tank comes ashore from a tank landing ship (LST) somewhere in the Mediterranean. Large enough to make ocean passages, but of shallow draught and capable of beaching, the LST became the standard amphibious assault ship from Normandy to the Pacific.

Born out of necessity, the ability of the Allies to wage successful amphibious warfare contributed in no small measure to the eventual downfall of the Axis powers. Development was astonishingly short, it being obvious after the fall of France that ultimate Allied success would require a cross-Channel assault, and the very nature of the Pacific War demanded mastery of the new form of battle.

Although in the late 1930s war in Europe was viewed by the services as only a matter of time, its likely form was difficult to predict, so available rearmament resources were expanded in generally conventional directions. The total subjugation by the Axis of Europe, and later the Far East, changed the situation completely. Both areas would need to be reconquered through the carriage by the Allies of vast forces over very considerable distances. Established ports, even if available, would be either heavily defended or destroyed and it was obviously desirable to put everything 'over the beach' in order to retain the initiative. Only the most basic consideration had been paid officially to landing craft before the war but, from the time of Dunkirk onwards the British developed ideas rapidly, passing them to the USA for implementation under Lend-Lease. By the time that the USA became embroiled, in December 1941, it had already accumulated much experience upon which to build.

The vast armada of amphibious warfare vessels ultimately produced was, for the most part, built to standards totally unacceptable before the war, but which held together and displayed a high degree of innovation. They fell into several major groups:

(a) ships for carrying the infantry themselves, the Landing Ships, Infantry or LSIs, which varied from ordinary troopships in carrying also their own assault landing craft;

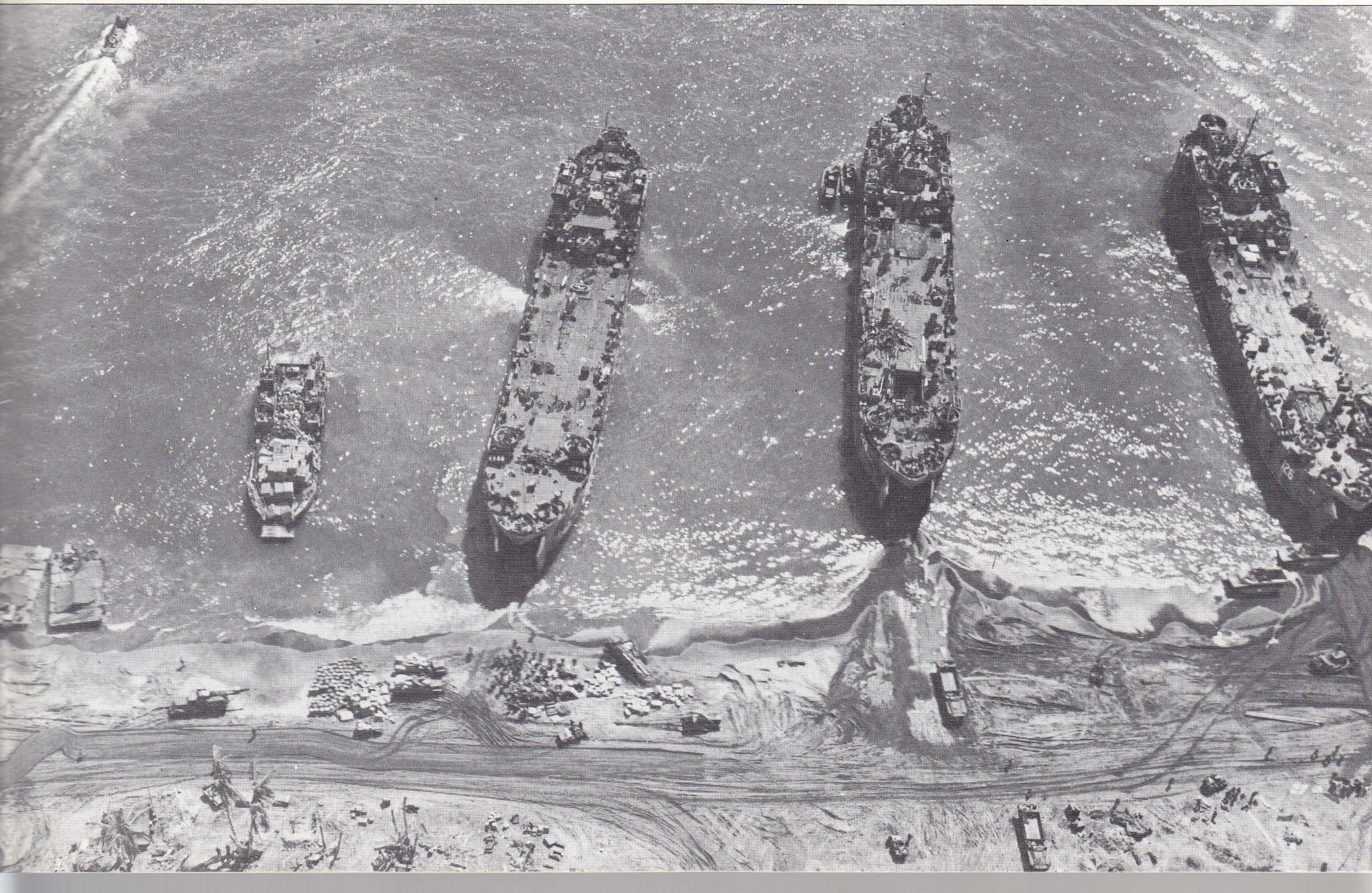
(b) ships, mainly Landing Ships, Dock or LSDs, for carrying smaller craft in numbers, these craft being of insufficient size to make protracted sea crossings;

(c) landing craft, smaller than landing ships, for putting vehicles, equipment and personnel directly on the beach, where categories (a) and (b) needed to anchor offshore; and

(d) miscellaneous vessels which covered a range as diverse as the vital Headquarters Ships to the humble, but equally vital, Landing Barge, Kitchen.

This motley armada of 'floating bootboxes' did not, of itself, win the war, but the war could not have been won without it.

LSTs (sometimes known to their crews as Large Slow Targets) unload supplies during the operations on Leyte Island. Two days later the largest sea battle in history was launched and the Japanese attempt to disrupt the landings ended in catastrophe in the titanic battle of Leyte Gulf.

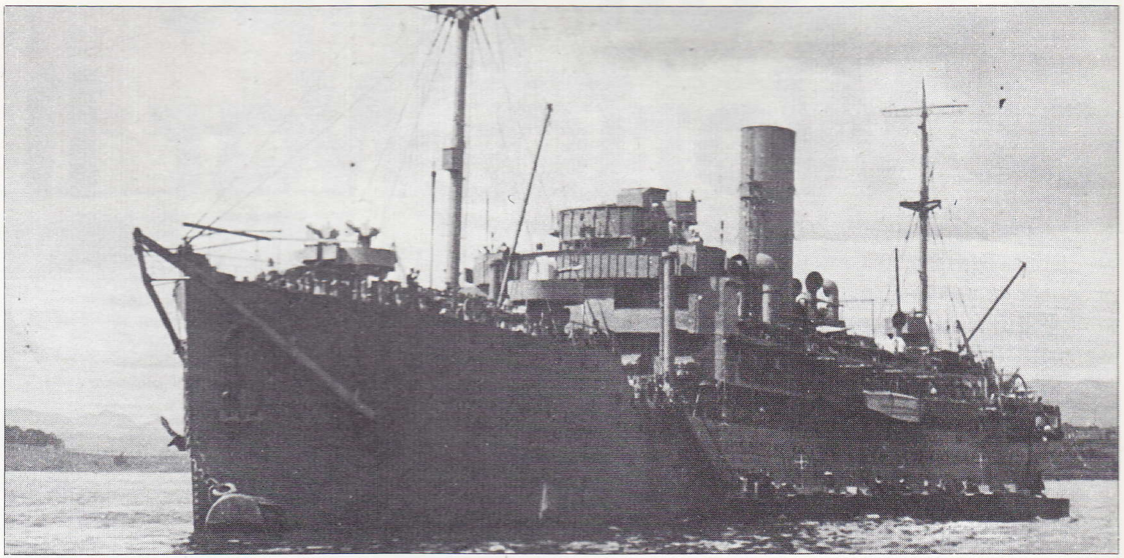


UK/USA

Landing Ship, Headquarters (LSH) and Amphibious Force Flagship (AGC)

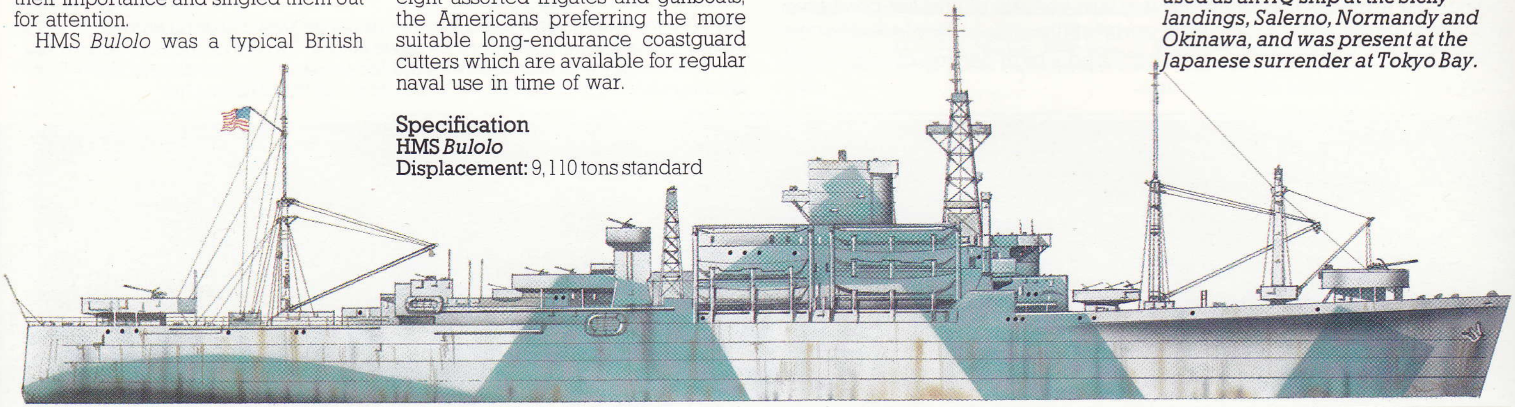
Amphibious operations are exceedingly complex and, despite meticulous planning and allowance for apparently adequate contingencies, everything that can go wrong will try to go wrong. Headquarters ships were devised to lie off the beach and control operations until a proper HQ could be set up ashore, after which they could probably stay on as long as there was any requirement for naval support. Early practice was to employ a major warship in the role, but suitably equipped ships were rare, never had sufficient accommodation and were liable to be called out to do some fighting. Not until 1942 were dedicated ships introduced: medium-sized merchantmen (with plenty of space for conversion) were selected, and these were instantly recognizable by the variety of communications antennas that were added (and, it was rumoured, by the wine bottles floating around them). These ships handled a tremendous volume of signal traffic, the embarked staff being able to make rapid decisions on the spot to counter any problem as it arose. On occasion the **Landing Ship, Headquarters (LSH)** even acted as an aircraft-direction ship, a complex-enough task in itself and usually undertaken by a specialist **Landing Ship, Fighter Direction (LSF)**, with which it worked closely. For major landings, more than one LSH might be required and, in any case, a replacement was a wise precaution, particularly when the enemy recognized their importance and singled them out for attention.

HMS *Bulolo* was a typical British conversion, starting as an armed merchant cruiser before doing a spell as an LSI. As an LSH she saw service at Algiers, in the Levant, at Anzio and, finally, at Normandy, where she was damaged by bombing. Other large British conversions were HMS *Hilary*, *Largs* and *Lothian*. The American equivalent was the **Amphibious Force Flagship (AGC)**, converted C2 and C3 hulls, the former going to 17 units. For smaller operations the British modified eight assorted frigates and gunboats, the Americans preferring the more suitable long-endurance coastguard cutters which are available for regular naval use in time of war.



HMS Hilary*, built in 1931 as a cargo-liner, spent the first part of the war as an ocean boarding vessel. She was converted into a headquarters ship in 1943, being fitted with the complex communication systems required to control an amphibious landing.*

Specification
HMS *Bulolo*
Displacement: 9,110 tons standard
Dimensions: length 125.7 m (412.5 ft); beam 17.8 m (58.25 ft); draught 6.6 m (21.7 ft)
Propulsion: two diesels delivering 4698 kW (6,300 bhp) to two shafts
Performance: maximum speed 15 kts
Armament: two twin 102-mm (4-in) AA, five single 40-mm AA and 14 single 20-mm AA guns
Capacity: as an LSI(L) six LCP(L)s and 258 troops
Complement: 264

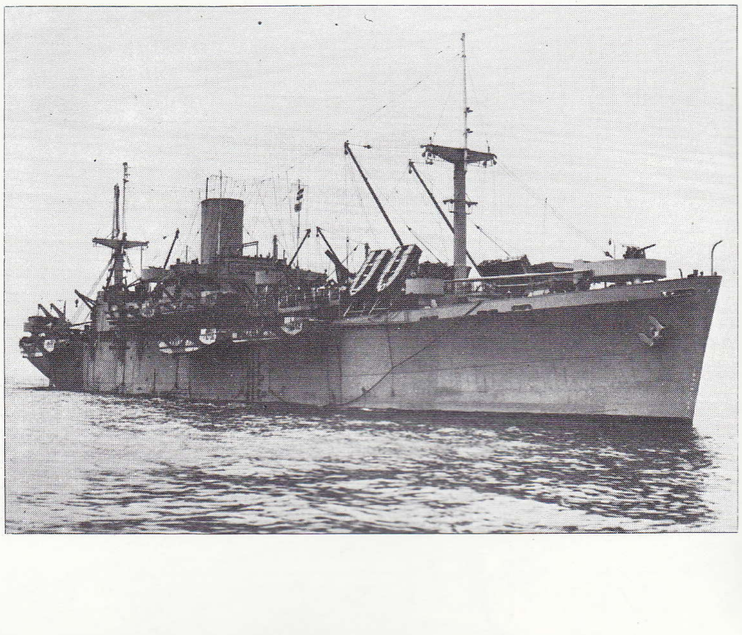


Formerly a liner, the USS Ancon *was taken over in 1942 as a transport, but soon became an amphibious force flagship with the US Navy. She was used as an HQ ship at the Sicily landings, Salerno, Normandy and Okinawa, and was present at the Japanese surrender at Tokyo Bay.*

UK/USA

Landing Ship, Infantry (Large) (LSI(L))/Transport (AP)

The **Landing Ship, Infantry (Large)** or **LSI(L)** was used for the delivery of troops over distances too great for their embarkation and support in landing craft. Many were little more than basic conversions of passenger or cargo/passenger liners, but others were rebuilt for more specific purposes. Such were the trio of Glen Line ships **(Glenearn, Glengyle** and **Glenroy)** converted in 1941 following initial service as stores carriers and commando ships. These were new and powerful ships built for the Blue Funnel/Glen/Shire services in the Far East, and the conversion involved much subdivision of the cargo spaces into accommodation for upwards of 1,300 personnel. Sleeping was in the traditional hammock, but mess spaces, latrines, wash places, and general stowage had to be created, together with space for such heavy equipment as had also to be put ashore. Extra sets of davits were installed for the stowage of 12 LCAs, and two heavier LCMs were also carried on deck, handled by the ship's derricks. The ships were well armed, commensurate with their high value, originally with eight 2-pdr pompoms but later with six 102-mm (4-in) AA guns, four 2-pdr guns and up to eight 20-mm Oerlikons. Despite heavy involvement, for instance in Crete, Syria, Malta and Dieppe, none of the three was lost. There were three further sisters; of these *Breconshire* of the Shire Line became briefly famous in her runs to Malta at the height of the siege until she was finally sunk. *Glengarry* was a fourth Glen ship, building in Denmark



The Empire Arquebus*, built in the USA under the massive US maritime commission programme and supplied under Lend-Lease. It was similar in many respects to the US Navy's 'General' and 'Admiral' classes, and like them was used as an infantry transport.*

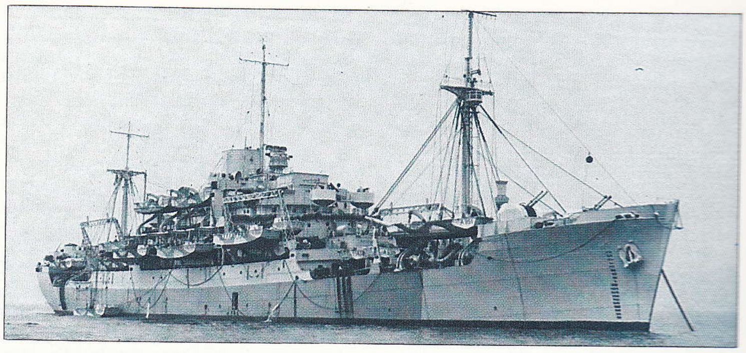
when the Germans invaded. She was converted to the auxiliary cruiser *Meersburg* and also survived the war. Last was the Blue Funneler *Telemachus*, converted to the escort carrier HMS *Activity*.

AP was the general category for American troop transports, modified to **APA** for the more specialist **Attack Transport** category. Most were basic conversions but notable classes designed to purpose were the 11,500-ton 'Generals' and 12,700-ton 'Admirals' with steam turbine or turbo-electric propulsion for about 20 kts. They went on to give very useful service after World War II.

Specification

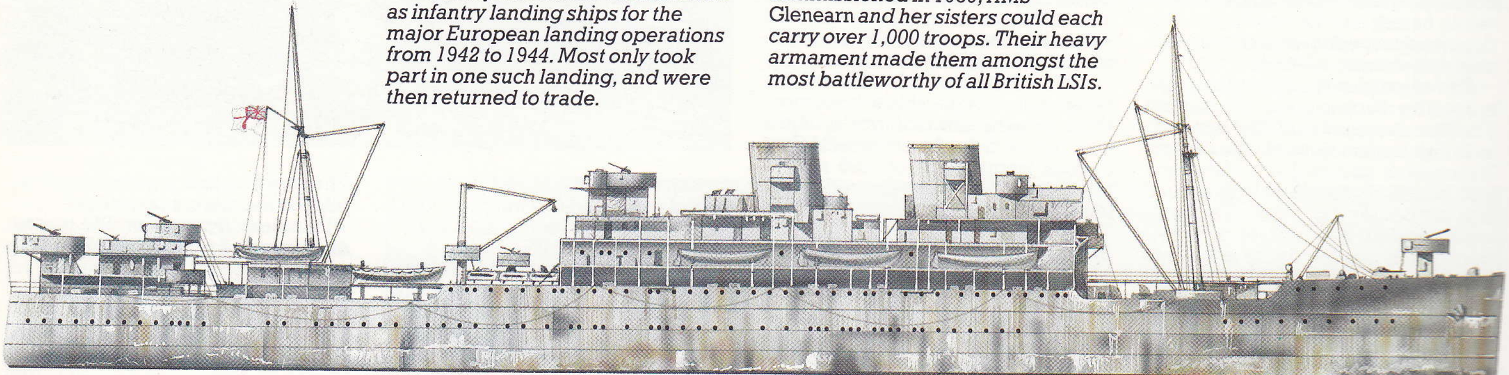
'Glen' class

Displacement: 9,800 tons gross
Dimensions: length 155.7 m (511 ft); beam 20.3 m (66.7 ft); draught 8.5 m (27.75 ft)
Propulsion: two diesels delivering 8948 kW (12,000 bhp) to two shafts
Performance: maximum speed 18 kts; range 22250 km (13,825 miles) at 14 kts
Armament: three twin 102-mm (4-in) AA four single or twin 2-pdr AA, and eight to 12 single 20-mm AA guns
Capacity: two LCMs, 12 LCAs, 232 landing craft crew and 1,087 troops
Complement: 291



Above: Requisitioned and commissioned in 1939, HMS Glenearn *and her sisters could each carry over 1,000 troops. Their heavy armament made them amongst the most battleworthy of all British LSIs.*

Below: Llangibby Castle *was typical of the many mercantile vessels fitted as infantry landing ships for the major European landing operations from 1942 to 1944. Most only took part in one such landing, and were then returned to trade.*



UK/USA

Landing Ship, Infantry (Medium) (LSI(M))/High-Speed Transport (APD)

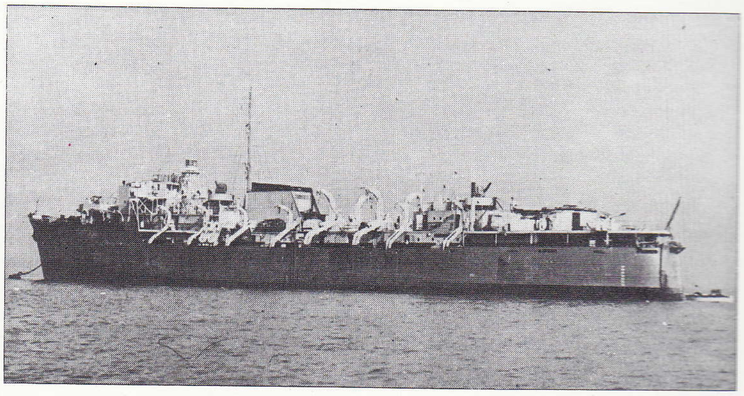
Cross-channel packets, though short-legged, were fast and showed great potential for conversion in World War I. So it was in World War II, with the bonus that the German invasion of the Low Countries provided many fine Belgian and Dutch ships in addition to British and French vessels. *Queen Emma (Koningen Emma)* and *Princess Beatrix (Prinses Beatrix)* had been completed by Dutch yards only months before hostilities and, being motorships, had the advantage of small machinery spaces and great economy. They were converted for small-scale assault as **Landing Ship, Infantry (Medium)** or **LSI(M)**, their large accommodation areas being ideal for some 600 complement: crew, landing craft crews and army personnel. The troops were put ashore by six LCAs, stowed under davits. Two LCMs were also davit-carried but the machinery's 39-ton capacity limited their use, the craft having to be pre-loaded with vehicles by crane. Both ships, together with several smaller ex-Belgian vessels, carried the bulk of the force on the Dieppe raid, all returning safely.

Not strictly similar in designed function but often used as such were the American **APD**, or **High-Speed Transport** ships. The first group comprised 32 very-similar flushdecked destroyers (the venerable 'four-pipers'). By stripping out the forward machinery spaces, accommodation was created for about 150 troops, though 200 could be carried over short hauls. Even with only half power remaining, they were still good for 23 kts. Topside, the two forward funnels and all torpedo tubes were landed and four LCP(R) added in davits. These 11-m (36-ft) craft could each land up to 36 troops. Each weighed about 6 tonnes in davits, and must have posed a stability problem to such narrow-gutted ships. These destroyer conversions were followed by nearly 10 rebuildings of destroyer escorts (DE) with very similar size and speed. These carried four LCVPs, nested in pairs under two distinctive gantry davits. Up to 150 troops, four carts, four 75-mm (2.95-in) pack howitzers and up to 255 m^3 (9,000 cu ft) of stores, ammunition and fuel could be carried, the ships being equipped with a pair of cargo booms (derricks) for their handling. The APD proved extremely useful in the island war of the western Pacific and, having retained her surface armament, was comparatively independent.

Specification

'Queen Emma' class

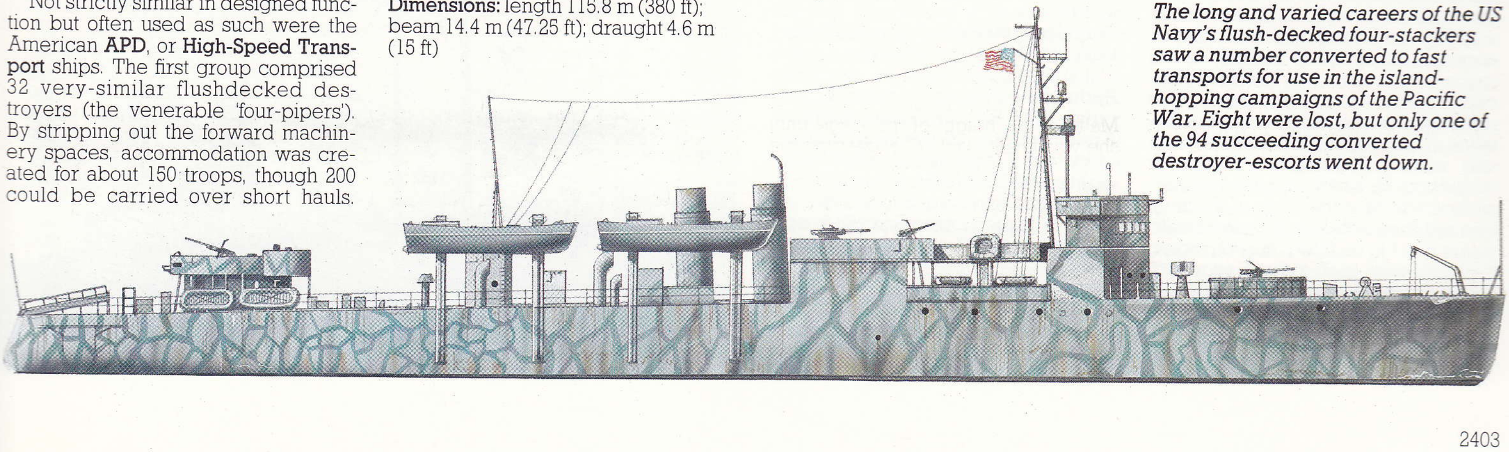
Displacement: 4,140 tons gross
Dimensions: length 115.8 m (380 ft); beam 14.4 m (47.25 ft); draught 4.6 m (15 ft)



Propulsion: two diesels delivering 9694 kW (13,000 bhp) to two shafts
Performance: maximum speed 22 kts; range 12979 km (8,065 miles) at 13 kts
Armament: two single 76-mm (3-in) AA, two single 2-pdr AA and six single 20-mm AA guns
Capacity: two LCMs, six LCAs, 60 landing craft crew and 372 troops
Complement: 167

HMS Princess Beatrix, *in common with most other Channel packets, was relatively fast but short-ranged. This was no real handicap on operations to the coast of Europe, and with her sister and several smaller ex-Belgian ferries she took part in the Dieppe raid.*

The long and varied careers of the US Navy's flush-decked four-stackers saw a number converted to fast transports for use in the island-hopping campaigns of the Pacific War. Eight were lost, but only one of the 94 succeeding converted destroyer-escorts went down.

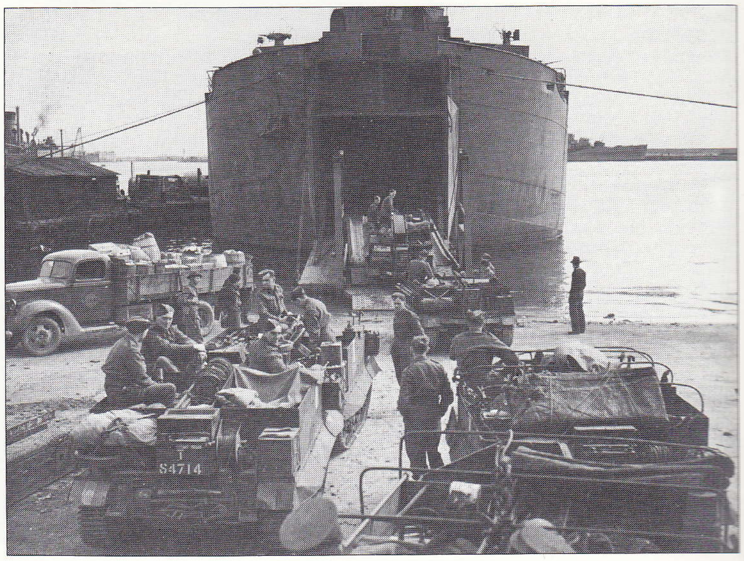


UK

Landing Ship, Tank Mk 1 (LST(1)), 'Maracaibo' type

As early as 1940 Winston Churchill's energetic mind was turned to matters offensive and he perceived the need for a vessel able to put armour and vehicles ashore 'over beaches' and 'anywhere in the world'. Ultimately ships could be designed and built for this revolutionary purpose but, at the time, only conversions were feasible to prove the concept. The problem was a nice one, for a beach of a gradient kind enough for the operation would have shallow approaches. This required a ship large enough both for ocean passage and to accommodate the designed load, yet of shallow enough draught to put her bows ashore. Even then it was likely that a considerable width of water would still exist between herself and the beach, so a bow door together with ramps of considerable length were needed.

The ships identified for conversion were the *Bachaquero, Misoa* and *Tasajera*, launched in 1937-8 and used in British operations to shuttle oil from Venezuela's shallow Lake Maracaibo and, therefore, designed with a mean draught of only 3 m (9.8 ft). Their original design was that of a turret-decker, the weather decks at the side flanking a deep centreline trunk. As the ships' length:beam ratio was only about 6:1, they had plenty of deck space once the side decks were plated over. The drawback was that the resultant tank deck was well above the waterline, making even more acute the design of the bow ramp. In the event, the already bluff bows were modified with a flat rectangular door which hinged from its lower edge. This allowed a two-stage ramp to be run down an internal slope, under the control of several winches. The first 21.6-m (71-ft) long stage supported a 16.5-m (54-ft) extension. While these permitted the dry landing of a 30-ton tank, they were very greedy of internal space. The 'Maracaibos' can claim to be the first LSTs and though far from ideal, particularly in terms of speed, these **Landing Ship, Tank Mk 1** or **LST(1)** vessels demonstrated the practicality of working on and off a beach in a controlled manner, the value of good subdivision and the need for well-distributed ballast space. Interestingly, even the eventual 'last word' in LSTs never claimed to be able to work more than 17 per cent of the world's beaches, with the American LCAC air cushion landing craft of 1985 not extending this beyond a reported 70 per cent.



The very first tank landing ship was HMS Bachaquero, *a converted 'Maracaibo' type tanker. She is seen in Alexandria in March 1943.*

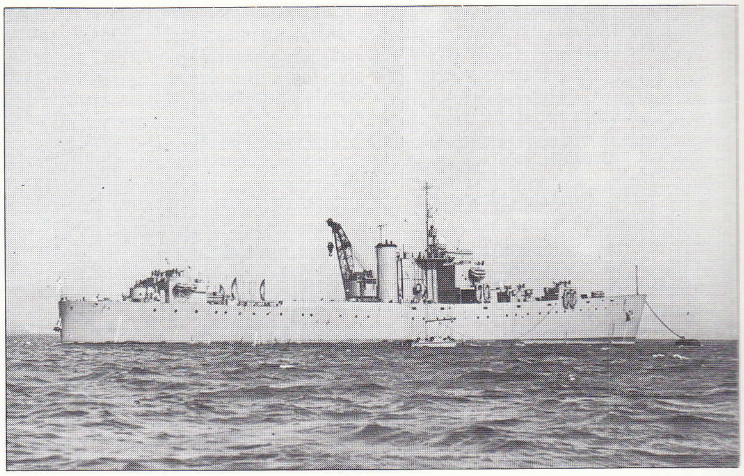
Specification

LST(1), 'Maracaibo' type
Displacement: 4,890 tons gross
Dimensions: length 116.5 m (382.5 ft); beam 19.5 m (64 ft); draught 4.6 m (15 ft); beaching draught 1.3 m (4.25 ft) forward
Propulsion: two sets of reciprocating steam engines delivering 2237 kW (3,000 ihp) to two shafts
Performance: maximum speed 11 kts; range 12045 km (7,845 miles) at 10 kts
Armament: two 102-mm (4-in) smoke mortars, and four single 2-pdr AA and six single 20-mm AA guns
Capacity: two LCMs, 20 25-ton tanks and 207 supernumeries
Complement: 98
(NB: the *Tasajera* was slightly smaller)

UK

Landing Ship, Tank Mk 1 (LST(1)), 'Boxer' type

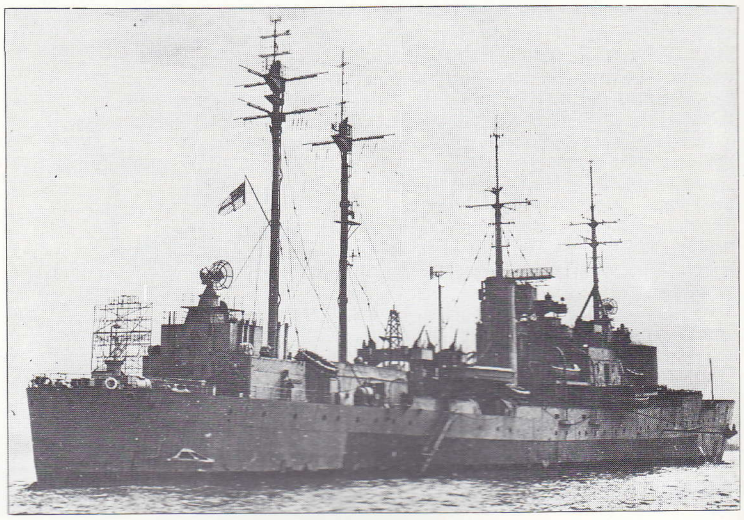
The 'Maracaibo' LST conversions were never viewed as more than useful prototype exercises and their 10-kt speed was widely criticized as insufficient for possible sea passages to a distant assault area. Although a higher speed directly conflicted as a design requirement with the needs for shallow draught, bow doors and large capacity, the first purpose-built LSTs, the trio of **Landing Ship, Tank Mk 1 'Boxer' type** for the Royal Navy, were capable of 17 kts. As it turned out, this speed was unrealistically high but the specification, it should be remembered, had been formulated without the benefit of any previous experience, the whole concept being novel. A bow door and ramp were regarded as essential and, as a ship-type bow was necessary, a pair of vertically-hinged doors was adopted (a 'first' for Harland & Wolff and later used on many post-war vehicular ferries) behind which a set of transverse watertight doors was placed instead of a conventional bulkhead. Thirteen 40-ton or 20 25-ton tanks could be stowed on the tank deck, which also formed the freeboard deck, close above the waterline and avoiding any hoisting or negotiation of steep ramps. Much space on this deck was lost, firstly because of the large inboard-stowing ramp that was required to span a distance of about 30 m (100 ft) to the shore and, secondly, through a deliberate reduction in area to reduce free-surface effects in the event of flooding. The resulting side subdivision allowed steam plant to be fitted, thus providing the relatively high power required. This machinery was placed amidships, with the uptakes and funnel offset to starboard to allow clear passage below. On the weather deck up to 27 loaded 3-ton lorries could be stowed via a vehicle lift from the tank deck. A hatch was provided abaft the superstructure, serviced by a 40-ton crane, to offload vehicles in the event of damage to the bow door. The complexity of the 'Boxers' (*Boxer, Bruizer* and *Thruster*) meant that the first was not ready until early in 1943, by which time the better features had been incorporated in the far superior LST(2s). The speed and endurance of the 'Boxers' thus saw them suitable for conversion to LSFs, with four tall masts covered in antennae for the purpose of aircraft direction.



HMS Boxer, *seen soon after her completion in early 1943, was the first vessel designed from the outset as an LST. A complex design, the three completed ships were beaten into service by the LST(2).*

Specification

LST(1), 'Boxer' type
Displacement: 3,615 tons standard and 5,410 tons full load
Dimensions: length 121.9 m (400 ft); beam 14.9 m (49 ft); draught 1.7/4.4 m (5.5/14.5 ft)
Propulsion: two sets of geared steam turbines delivering 5220 kW (7,000 shp) to two shafts
Performance: maximum speed 17 kts; range 14830 km (9,215 miles) at 14 kts
Armament: two 102-mm (4-in) smoke mortars, and four single 2-pdr AA and eight single 20-mm AA guns
Capacity: 20 medium or 13 heavy tanks, 27 loaded lorries and 193 troops
Complement: 169



By the time of the invasion of Normandy, the three 'Boxers' had been converted to LSF (Landing Ship Fighter-direction).

UK/USA

Landing Ship, Tank Mk 2 (LST(2))

Even while the three LST(1)s were still in the early stages of construction, before Pearl Harbor and the USA's entry into the war, it was realized that a great number of large landing craft would ultimately be required for the assault that would have to precede the reconquest of Europe. Only construction in the USA under Lend-Lease terms could produce these numbers, but the resulting ships would need to be capable of crossing the Atlantic. The conception of the **Landing Ship, Tank Mk 2** or LST(2), despite frequent US claims to the contrary, was British and was worked out in detail by a British mission in Washington in the winter of 1941-2, the first order being placed in February 1942.

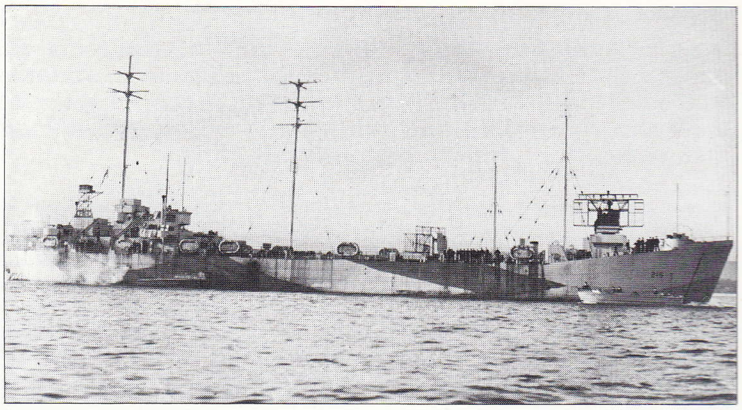
The major differences from the LST(1) were the adoption of an engines-aft layout, a smaller length:beam ratio and an acceptance of a 10-kt maximum speed. A suitable locomotive-type diesel was available in the USA. Two of these developed sufficient power while having only a limited height, enabling the tank deck to be continued over the machinery space, and thus run the full useful length of the ship. By adopting a bluff, beamy form, the loaded draught was considerably reduced; for sea passages the ship could be ballasted down and, for beaching, trimmed by the stern to give a very small forward draught. This, in turn, enabled the vessel to ground much closer to the tideline and only a short ramp was fitted inside the vertically-hinged bow doors. On beaches with the minimum declivity of 1 in 50 this still meant a lot of water for vehicles to traverse, and research was started into their waterproofing. Only with the adoption in 1943 of sectioned pontoons for the rapid construction of ship-to-shore causeways was the problem really solved.

A spacious upper deck, encumbered only with the exhaust vents from the tank deck, was served both by hatch and elevator (or ramp in later versions). It could be used for stowage of lighter vehicles or, if required, an LCT(5) or LCT(6). Heavy gravity davits could accommodate up to six LCVPs for use as lifeboats or general utility craft. The double-skin hull flanking the tank deck gave accommodation to up to 163 army personnel.

The LST(2) became the standard assault ship and played an indispensable role in all theatres, 1,077 of these ships being built between 1942 and 1945.

Specification

LST(2)
Displacement: 1,490 tons standard and 2,160 tons full load
Dimensions: length 100 m (328 ft); beam 15.2 m (50 ft); draught 0.9/2.9 m (3.1/9.5 ft)
Propulsion: two diesels delivering 1341 kW (1,800 bhp) to two shafts
Performance: maximum speed 10.5 kts; range 11120 km (6,910 miles) at 9 kts
Armament: one 127-mm (5-in) or 76-mm (3-in) DP guns, which was usually omitted when the full secondary battery of two twin and four single 40-mm AA and six to 12 single 20-mm AA guns was carried
Capacity: two LCVPs, 18 heavy tanks, 27 lorries or one LCT(5), and 163 troops
Complement: 211



Above: LST 216 after conversion to fighter-director. Offices built into the tank deck included those for communications, fighter control and radar plotting, as well as workshops and stores.

Below: Unloading equipment from LST(2)s at the Allied beach-head at Anzio. Such scenes were to become common in every maritime theatre of the war, with the ubiquitous LST continually coming and going.

UK/CANADA

Landing Ship, Tank Mk 3 (LST(3))

So well did the LST(2) suit the needs of the Americans that the UK had difficulty in being allocated suitable numbers from the construction programme that it had itself initiated. Eighty were needed, and it was decided to improvise on the LST(2) design, with 45 to be built in the UK and the remainder in Canada. There were two major problems.

Firstly, the locomotive diesels used by the Americans were fully committed and, as no alternative existed to the British, they had to specify the simple steam reciprocating engines used in the frigate programme. As amphibious warfare ships were now commanding a priority as high (or even higher) than frigates, this caused little headache, but the machinery and its boilers were bulky and heavy, both intruding into the tank deck space and causing the ship to ground by the stern rather than the bows on beaches of minimum declivity.

The second problem lay in construction techniques for as British and Canadian yards had, as yet, no experience in large-scale welding, riveting was necessary. Even though a hard chine was adopted to simplify construction, the **Landing Ship, Tank Mk 3** or **LST(3)** took longer to build, and the resulting low-efficiency hull was disappointingly slow. Though significantly longer to accommodate the steam machinery and disposing of over three times the power, the LCT(3) was only 3 kts faster than the diesel-driven American LST(2)s. No camber was included on the weather deck; this was a counter-productive shortcut as loose water was very loathe to disperse.

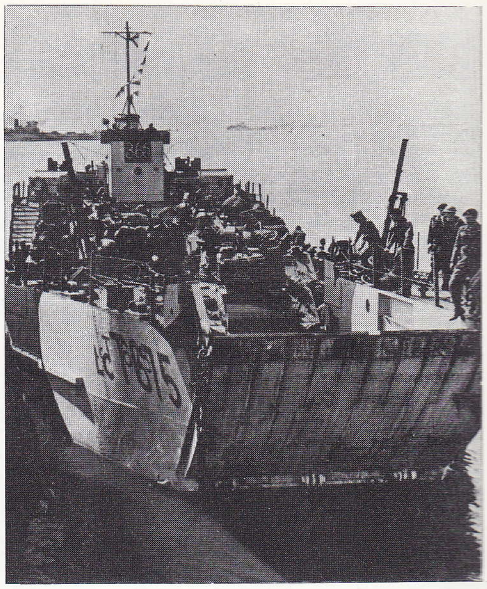
With their deeper draught, the LST(3)s tended to ground farther from the dry beach and a double-section bow ramp was incorporated as part-compensation, although floating causeway sections were again a successful answer. The LST(3)s were very well built, having LCAs under their gravity davits and the capacity to stow up to seven LCM(7)s on the upper deck. These were offloaded via a 30-ton SWL derrick set on a portside kingpost forward of the bridge. A 15-ton derrick was stepped on the other post. Though a few of the programme were eventually cancelled, the 44 British and 28 Canadian ships completed gave 20 years and more of post-war service.

Specification

LST(3)
Displacement: 2,255 tons standard and 3,065 tons full load
Dimensions: length 105.4 m (345.75 ft); beam 16.5 m (54 ft); draught 1.4/3.5 m (4.5/11.5 ft)
Propulsion: two sets of reciprocating steam engines delivering 4101 kW (5,500 ihp) to two shafts
Performance: maximum speed 13.5 kts; range 14822 km (9,210 miles) at 11 kts
Armament: two twin 40-mm AA and six single 20-mm AA guns
Capacity: five LCAs, 15 heavy or 27 medium tanks, 14 lorries and 168 troops
Complement: 104

The Normandy Shuttle

The greatest amphibious operation in history had participants both great and small, from the lonely paratrooper lost in the night to the sweating gun-crews on the battleships. Yet there was one group, largely unsung, without whom no invasion would have been possible; upon whom success or failure depended, and who kept the invasion going until the capture of a workable port. Without the landing craft and their crews, there would have been no triumph.



LCT 675 noses into the beach with a cargo of Shermans, men and ammunition. The LCT(4) could carry six medium tanks, or 300 tons of cargo. Although the type was of flimsy construction, the LCT(4) was able to withstand a surprising amount of damage.

Everyone has seen the typical war movie with a landing craft making a fleeting appearance. Invariably both emphasis and camera are on the men or machines being landed, and very little is said or shown about the craft itself, which is a pity. Not only did it take a tremendous amount of skill, guts and training to run these craft, but World War II could not have been won without them. Lightly armed and lightly armoured, landing craft were used in thousands of engagements from small, highly secret commando reconnaissance raids to full-blooded invasions. The men who lived and often died on board have largely been forgotten, for a landing craft lacks the glamour of a major warship. And yet landing craft epitomized the courage and pure seamanship that made the Royal Navy famous throughout the centuries.

This account is partly about one such man who sailed on landing craft during World War II. He had joined the Royal Navy as a boy seaman, being seconded to landing craft shortly after Churchill stepped up the Royal Navy's amphibious role. He finished the war as a Stoker, First Class.

'I was part of Coastal Forces when they transferred me to landing craft . . . and that meant I was suddenly part of Combined Ops. I remember we were trained at Poole in 1943 – battlefield conditions, you know – up to 10 days of having them fire live ammo at you on practice landings. There were a lot accidents and quite a few kills, I can tell you. 'Course we knew what was planned . . . I remember, it was in late August, early September in '43 when we picked up some LCTs (Landing Craft, Tank) in Gosport and sailed them across the Channel. Then we just spent a day sailing up and down 20 miles off the French coast – it was a dummy run, you see, they wanted to know how Jerry would react. Well, he didn't do anything, no guns no nothing. I'm glad he didn't open up with his coastal batteries, I can tell you!'

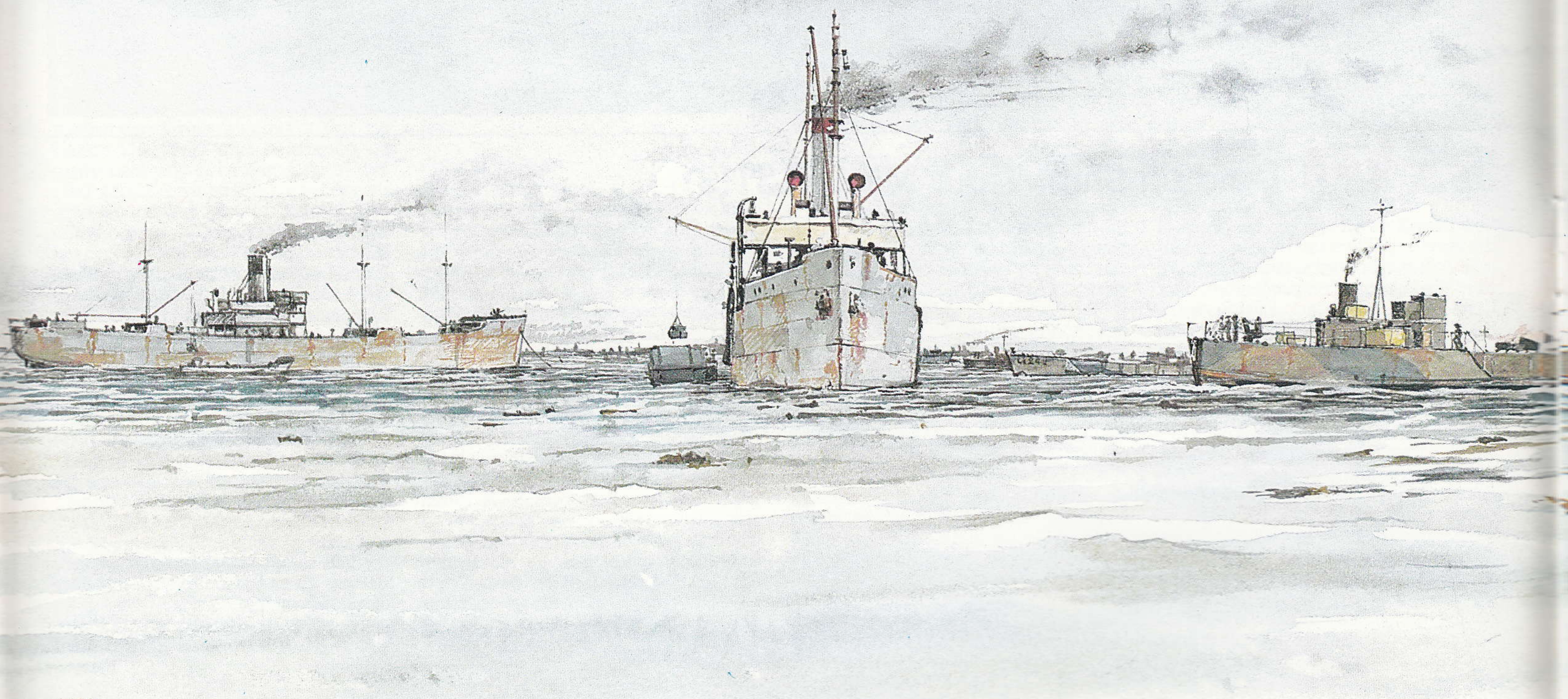
Flotillas organized

Landing craft personnel were organized into flotillas of up to 1,000 men. Personnel were assigned as necessary, to LCTs (Landing Craft, Tank) or LSTs (Landing Ships, Tank) and all the minor landing craft: LCAs (Assault, carrying British Commandos or US Rangers), LCPs (Personnel, otherwise troops), LCVs (Vehicle, also used to carry stretcher cases off the beach-head) and LCMs (Mechanized, carrying one truck or two jeeps).

'But the funniest ones were the small, very fast craft the Yanks produced. They were called "Eurekas", and you know what? They'd been used for booze running during Prohibition and could carry 15 commandos. They were marvellous for special ops, marvellous.'

'Fair stood the wind for France'

The greatest invasion fleet ever assembled sailed from England on the night of 5/6 June 1944: 2,727 ships carrying troops, stores and 2,500 landing craft approached the French coast escorted by 700 warships including five battleships, 23 cruisers and 104 destroyers. Five Allied divisions were landed, two American, two British and one Canadian; the British and Canadians landed on beaches code-named 'Gold', Juno' and 'Sword', the US forces on 'Utah' and 'Omaha'. Once the leading waves of troops had secured the beaches, the race began to shuttle fuel, ammunition and more men to the beach-heads before the Germans launched their counterattack. Here at 'Omaha' the stalwart defence of the German 352 Division threatened to defeat the US landing altogether.



Landing craft crew trained between six and 10 months for D-Day, at Dartmouth, Poole and Inverary, the last being the point where the boats were picked up and sailed down to the south coast.

'I spent most of my time on an LCT Mk 4. Carried a crew of 14 (four officers) and the skipper was usually a senior sub-lieutenant. Draught forward was 3 ft and aft 5 ft – that's loaded. The officers bunked in the wheelhouse, and we all bunked in the galley space aft. And that measured 10 ft by 10 ft, and the only way in or out was by ladder and a 2-ft diameter hatch. We could carry up to six Shermans – there was space for their crews in the welldeck – and we were powered by Paxman Ricardo diesels. We also had two jennies for electric power. Not many people realize that we actually lived on board . . . well, we had to, because when the invasion was on, we were going night and day, nonstop I can tell you.'

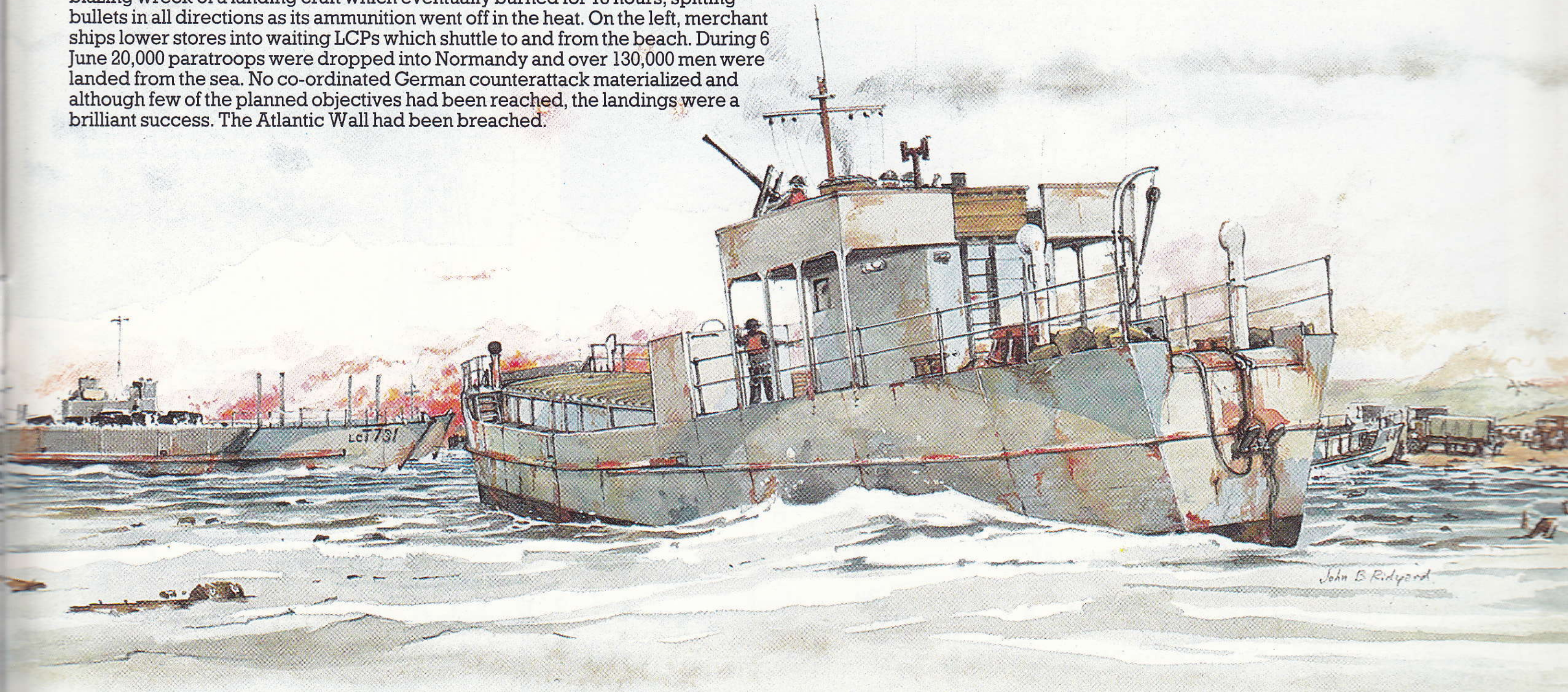
Royal Navy Commandos

Another important group of men, not well known by the general public, were the Royal Navy Commandos. While most people are aware that the first Commandos were naval, not many people are aware of the Royal Navy's continuing role after first the army and then the Royal Marines (who not unnaturally claimed that they had always done the job anyway) took over the function. In fact, Royal Navy Commandos had a specific job that continued throughout the war: make the first landing in order to help guide the landing craft in shore. It all sounds quite simple, but it has to be borne in mind that the naval Commandos could well have landed the previous day, found somewhere to hole up and stayed there until it was time to bring the other troops ashore. It was not one of your action-packed 'death or/and glory' jobs, except for the moments when the landing craft were arriving in numbers, because a considerable part of the Royal Navy Commando's skill lay in not being seen. As one can imagine, it took a very special type of man to do a job like that; the only modern day unit that can provide similar skills is the Royal Marines' Special Boat Squadron.

The scenes on the beach may have been chaotic, but once the fighting had moved inland the logistical forces could get on with moving some of the 2 million or more tons of matériel stockpiled in the south of England.

As one can well imagine, life on board a landing craft was naturally dominated by the personality of one man, the skipper. In a larger ship a bad skipper can to some extent be nullified by the other officers. By the very nature of the command structure, there are whole areas where his (possibly malevolent) influence will be watered down. It works in reverse as well: one of the functions of more senior officers is to protect the men from the incompetence of bad junior officers. Obviously, in a small and isolated landing craft, this system could not prevail.

On the right, an LCT(3) reverses out to sea with its pull-off anchor already stowed; off the port bow can be seen two LCT(4)s making their way inshore while to starboard an LCT(4) is unloading. The flames in the distance come from the blazing wreck of a landing craft which eventually burned for 18 hours, spitting bullets in all directions as its ammunition went off in the heat. On the left, merchant ships lower stores into waiting LCPs which shuttle to and from the beach. During 6 June 20,000 paratroops were dropped into Normandy and over 130,000 men were landed from the sea. No co-ordinated German counterattack materialized and although few of the planned objectives had been reached, the landings were a brilliant success. The Atlantic Wall had been breached.



High and dry upon the beach, an LST(2), an LCT and a cargo vessel overlook troops making their way into Normandy. In the foreground, the white ensign indicates the position of the Royal Navy beachmaster and his control party.

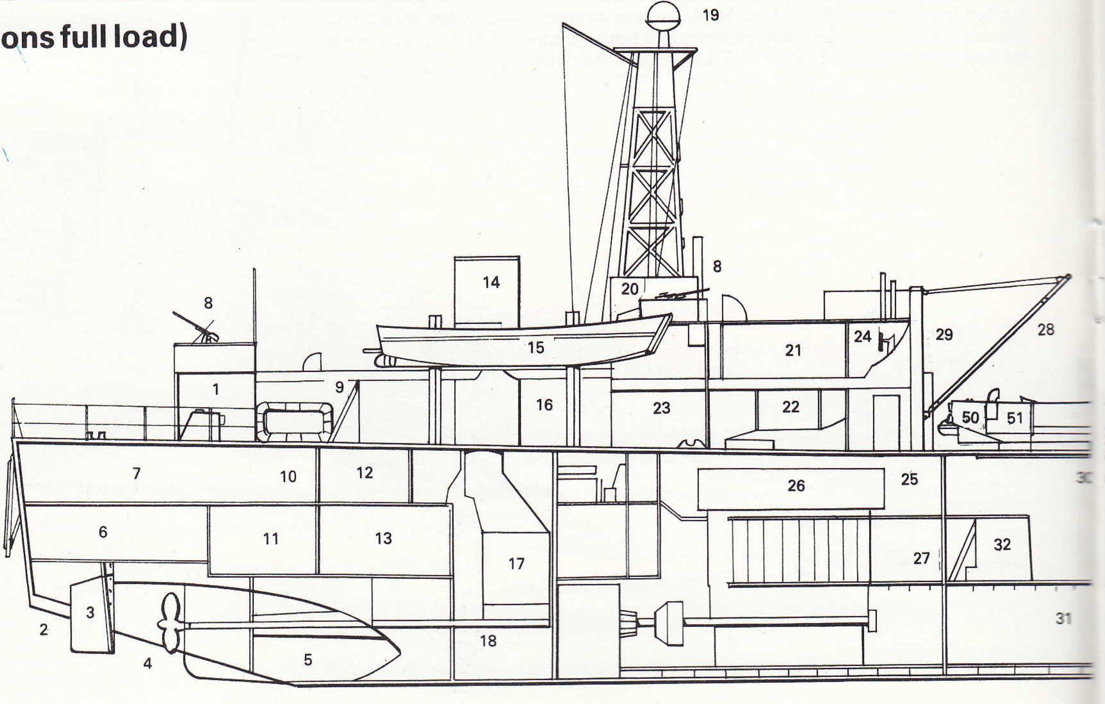
'Some skippers were wonderful men – go anywhere with them, we would. And with one in particular we did. Not because he was so charming, you understand. But because he knew his job. But some of the others . . . do you know, we had one skipper who was so bad, he actually managed to get us lost going across the Channel? Of course there was a good reason for it: he was drunk at the time and somehow we turned to starboard when the rest of the convoy went straight on. 'Course we knew what he had done, but there was no real danger so we let him find out for himself. The other type of skipper we didn't like was the really keen one, you know – gung ho. The kind that volunteered his boat and men for every dirty, dangerous job going or took unnecessary risks. But the first skipper I mentioned, he was something special. I remember the cox'n we had then as well . . . a Stornoway man, spent time on trawlers and could navigate by the stars as easily as you could read a road sign. It was on that boat that we won the Blue Ribbon, for most trips across.'

Conditions on board were primitive, but like all good matelots the crew managed to keep themselves clean, after a fashion at least. 'You did your dhobying [clothes washing] and had your bath all at the same time. What you did was get a bucket of hot water, first wash out your underpants and vests, then your overalls. And then you took that bucket and washed yourself, emptying it out all over you down into the bilges. Well, it wasn't the Ritz but we were grateful for it, make no mistake.'

And for relaxation, for some reason the LCT crews played cribbage. This is strange, because the great game in the Royal Navy is 'uckers' or ludo. but the LCT boys played cribbage, though not for money. 'No, we played for our rum ration. See, we divided one tot into 64 sips [sippers] or eight gulps [gulpers, and there were obviously eight sips to the gulp]. That rum was worth more than its weight in gold. Someone asked me the other day if we took drugs to keep us going. We didn't need them. We didn't need them because we had

Landing Ship, Tank Mk 3 (4,820 tons full load) cutaway drawing key

1 Winch
2 Keel
3 Double rudder
4 Screws
5 Well
6 Steerage compartment
7 Seamen's mess
8 20-mm machine-gun
9 Galley
10 PO's mess
11 Store
12 Magazine
13 Sick bay
14 Funnel
15 LCA on davits
16 Davits
17 Boilers
18 Shaft
19 Radar
20 Radar office
21 Bridge
22 Wardroom
23 Officers' quarters
24 Wheelhouse
25 Engine room
26 Two 2051-kW (2,750-hp) reciprocating steam engines
27 Companionway/lobby
28 Crane
29 Light armour plate around bridge
30 Hatch cover
31 Fresh water
32 Troops' mess
33 Troops' quarters
34 Fuel oil
35 Fuel oil/ballast
36 Ballast
37 Tank deck
38 Sherman tanks
39 Companionway
40 Exhaust vent
41 Chocks
42 Stowed ramp extensions
43 Ramp in stowed position
44 Anchor winch
45 Gun platform
46 Double clam doors
47 Ramp (1 in 50 slope to beach)
48 Ramp extension
49 LCA
50 Fuel
51 Two Ford V-88 48-kW (65-hp) engines
52 Armoured doors
53 Ramp
54 LCT Mk 6
55 Winch
56 Catwalk
57 Vent
58 Bridge
59 Wheelhouse
60 Light armour plate on side
61 Light armour plate on face
62 Crew quarters
63 Three 168-kW (225-hp) Gray diesel engines
64 Collapsible davit
65 Triple screw
66 Fuel/ballast



our rum!' It was not just the Royal Navy who appreciated the value of rum. When training for D-Day started, the US Rangers soon acquired a taste for it, as American ships were (and still are) dry. Moreover, as anyone who has tasted it can tell you, Royal Navy rum was like nothing else. It could, depending on the strength and the circumstances, make one feel the bravest man in the world (without impairing one's ability to function too much!), or it could relax one to the point of being able to sleep through the noisiest bombardment. The Rangers knew a good thing when they drank it, and luckily had something of their own that the LCT crews prized almost as much.

'It was their "K" rations. Lovely, they were . . . tastiest rations I ever had, and they also came with those self-heating cans. So we used to barter our rum for their rations and we all ended up happy.

'Omaha' Beach

'But those Rangers were good troops. Some of the bravest I ever fought with. We took them into "Omaha" Beach, and I remember watching as they clawed their way up those almost vertical cliffs because someone higher up had made a mistake and sent us to the wrong place. And Jerry was holding his machine-guns out, pointed down that cliff and just spraying those Rangers off, just like you would hose down a dirty wall. But the Rangers got up there all right. Must of them had our rum inside of them!'

In fact, the Germans had little else beside machine-guns at 'Omaha' Beach because the naval bombardment had taken out all the bigger guns. There was 'negative defence' as the saying goes, and the Germans had been 'flattened down'. Except for the machine-guns, anti-tank guns, mortars and mines. Many landing craft lost their screws to mines, small anti-personnel mines that had been fixed to the cross beams that were part of the underwater defences.

Once the invasion had started, crossing the Channel fell into a set routine. 'We'd load up at Portland Hard, then slip around the buoy and wait for the weather. If we had time we'd do a bit of fishing, then across to France. That took 16 hours, steaming at 8 kts. Then we'd unload, turn round and back to Portland.

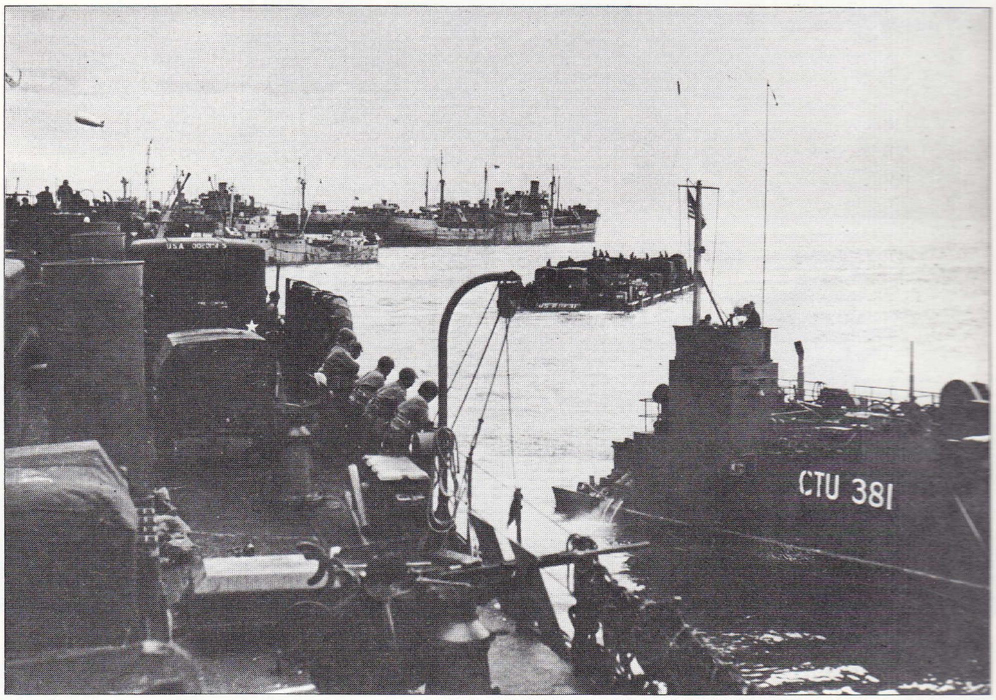
'When we got there, if we were lucky we had time for a drink ashore while we were being loaded up again – our own stores and fuel and with whatever we were carrying across. But I think the most time we ever had was two pints worth, the loading was that quick! And that went on day after day after day . . . and we were lucky with the weather, too. Only time it turned a bit nasty was on the fifth or sixth day when a Force 10 gale blew up and that was the only thing that slowed us down.'

Three shillings a day

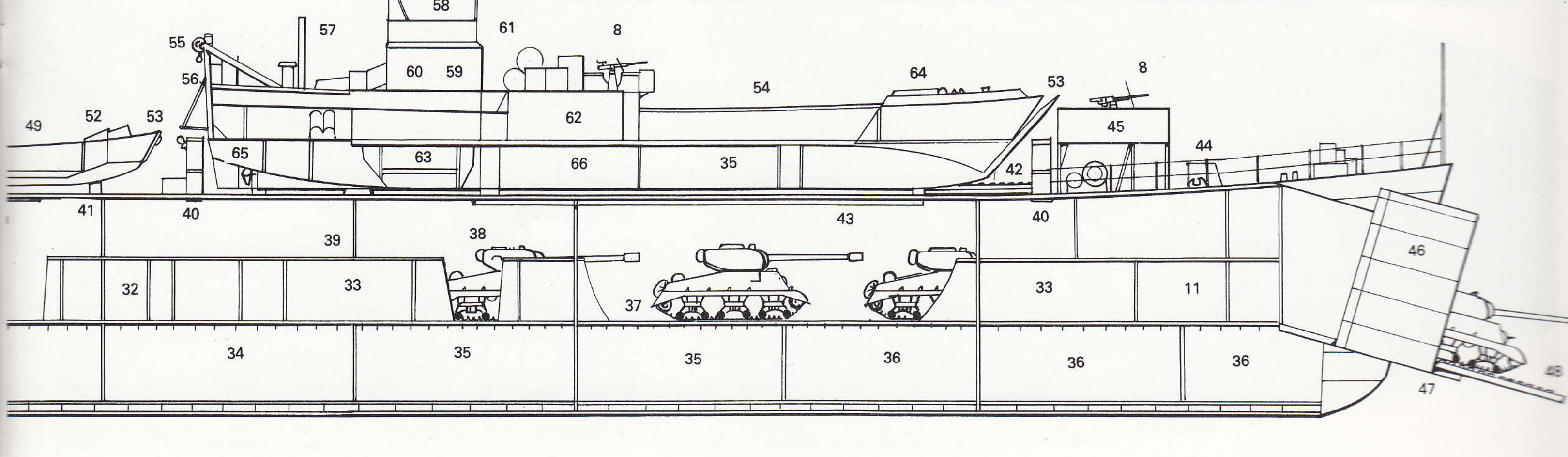
Incidentally, the average wage of an LCT crew member (rating) was 3 shillings (15p) per day. Out of that they would be stopped a percentage to pay for their shoes (19 shillings/95p), 'tiddly suit' (50 shillings/£2.50), jersey (£1), socks (6d/2.5p per pair) and towels (10d/4.17p each). In other words, they were into the Navy for about six weeks wages before they even started.

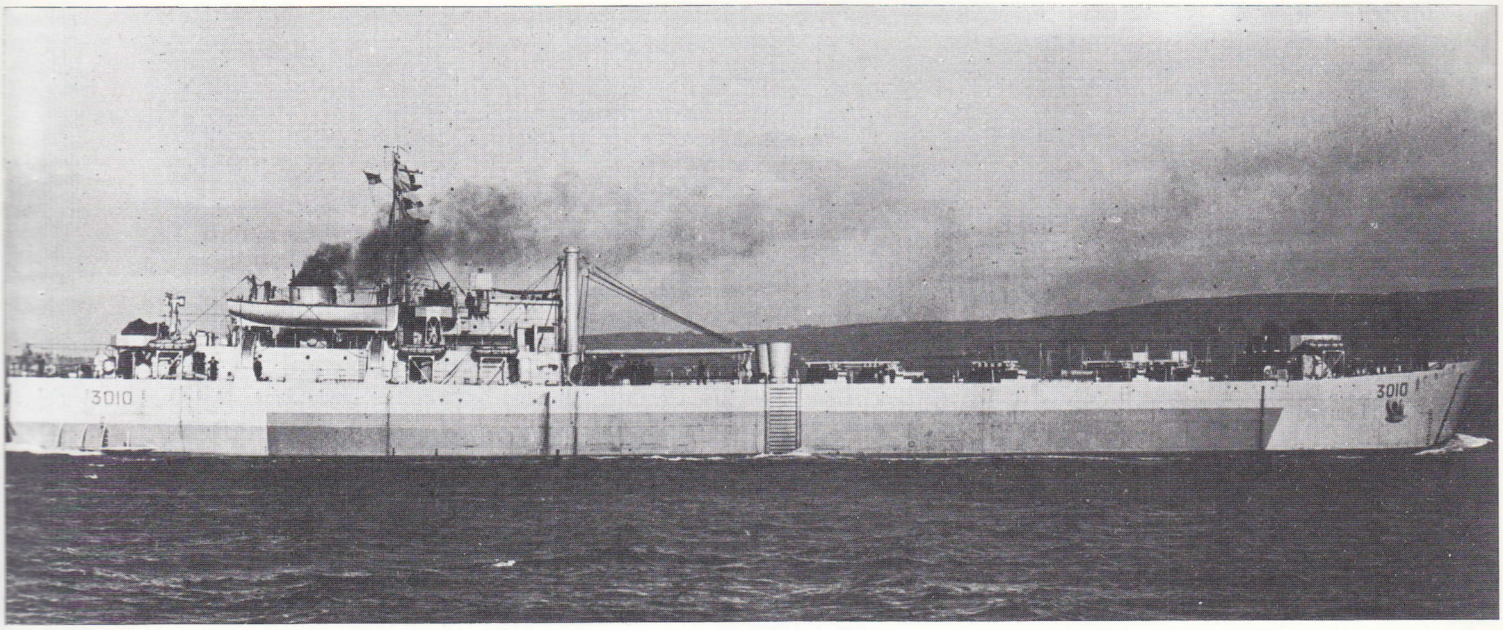
There is an old Royal Navy saying that when one of their ships goes to sea, it is with the full ship's complement either at their stations or parading on deck. When the merchant navy goes to sea, it is with two men and a dog on deck. The landing craft managed to reverse this trend: a great many of them had a ship's dog. 'We had a lovely old dog, a bulldog called Bill. Went everywhere with us, he did. Nothing worried him, just so long as he had somewhere to sleep and plenty to eat. I've seen whole crews, from the skipper down, in tears when their ship's dog died. I knew how they felt when we lost old Bill. See, we'd finished with the Normandy landings and were on our way out to the Far East. Well, we got as far as Alexandria when the Americans dropped the bomb, and that finished that. But we'd taken Bill with us, and the heat in Egypt got to him. Well, he was getting on. But it seemed a shame to have come through so much only to die of heatstroke in Alex. No, there's no way we could have left him behind in England. Bill wouldn't have put up with it. So we gave him a proper burial at sea with full naval honours. After all, he was one of our own, a Combined Ops dog. He was entitled as much as anyone else.'

The contribution that the men of Combined Operations made to the war can never be too highly praised. And quite simply, without the skill, courage and determination of the landing craft crews the Normandy invasion could never have taken place. And it was all done for love of country, pride of service, a tot of rum, and 3 shillings per day.

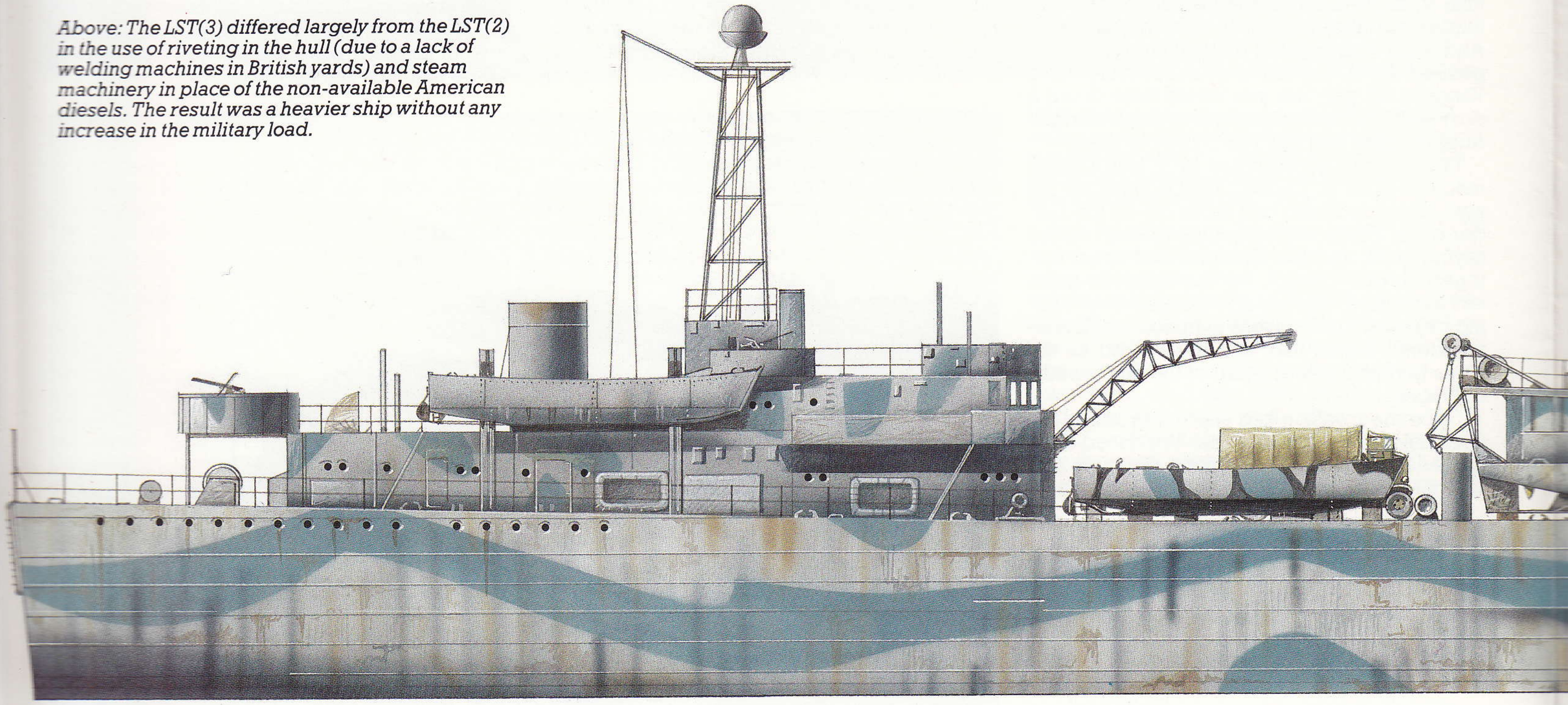


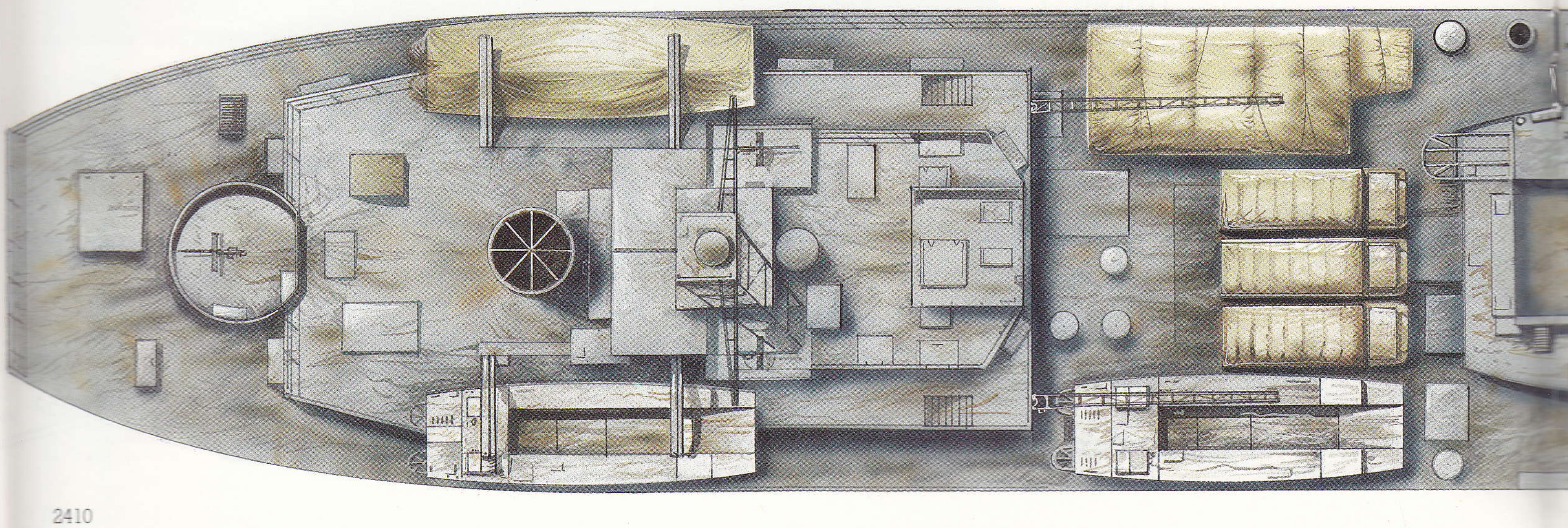
Mixed US attack transports and cargo vessels unload troops and equipment onto 'Rhino' ferries. By 1 July the Allies had landed 920,000 men, 600,000 tons of equipment and 177,000 vehicles onto the Normandy beaches.





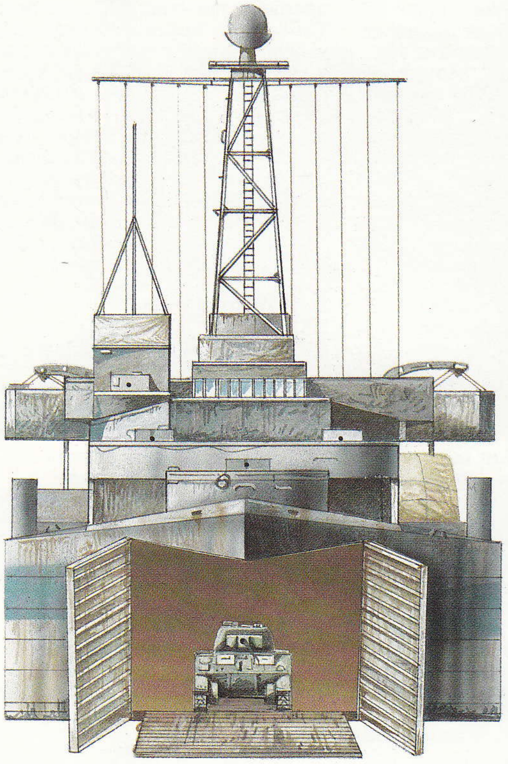
Above: The LST(3) differed largely from the LST(2) in the use of riveting in the hull (due to a lack of welding machines in British yards) and steam machinery in place of the non-available American diesels. The result was a heavier ship without any increase in the military load.

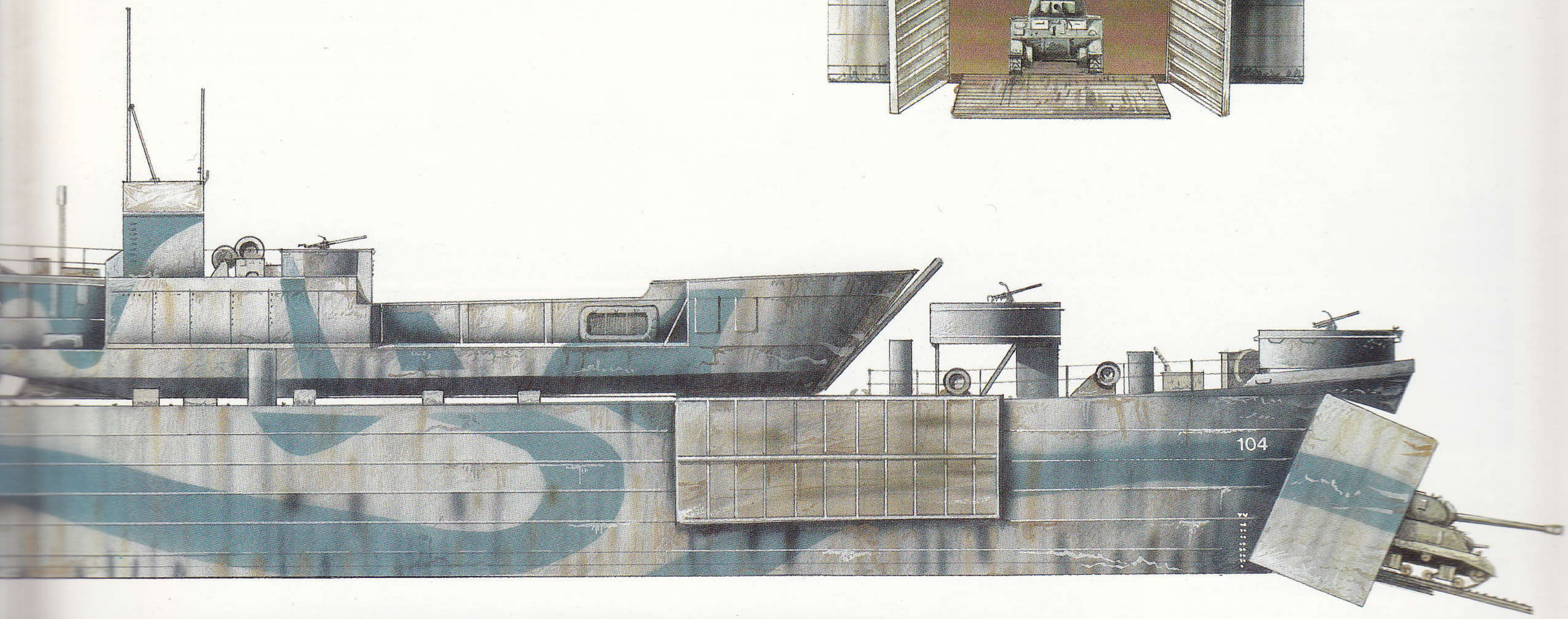


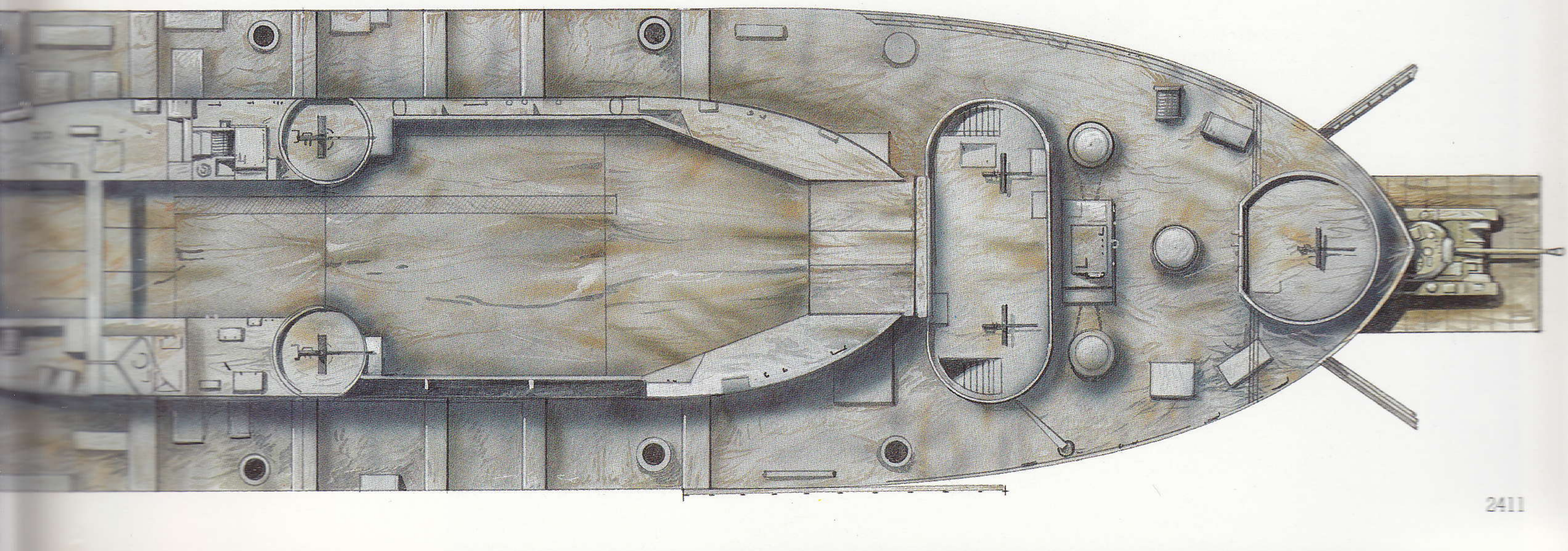


Landing Ship, Tank Mk 3

Right and below: The original LST(2) had been designed as a compromise between the sea-keeping qualities of the original British-designed tank landing ship, and the simplicity and ease of construction of the larger landing craft then being built. In the event it succeeded admirably, but not enough were in production for both British and US needs, and so the LST(3) was built in British yards. It could carry up to 15 tanks at 40 tons, as well as a deck cargo combining a single LCT(5) and a combination of lorries, LCMs, LCVPs or LCPs.







UK/USA

Landing Ship, Dock (LSD)

So many examples of the **Landing Ship, Dock (LSD)** and its derivatives have been constructed by the Americans during the last 40 years that one could be forgiven for assuming that the concept stemmed from the US Navy. In fact the draft was prepared in the UK as a carrier for the largest LCTs then envisaged. This was September 1941, when the sea-going LST had not yet been developed. The LCT was not regarded as sea-going yet, loaded, was far too heavy to be handled by the likes of the LSS or LSG, hence the idea of floating them in and out of a self-propelled floating dock. The draft was put to the Americans for completion and execution under the terms of Lend-Lease. Seven were requested but, in the event, the Americans completed another 20 to their own account. The 27 ships were launched between 1942 and 1946.

They were designed around a pontoon deck (or dockfloor) large enough to stow two LCTs. This was enclosed by the dock walls and a full-width stern gate pivoted at the lower edge. From the forward end of the dock well the craft was an orthodox ship. All were steam-propelled, the first eight having Uniflow reciprocating engines and the last seven conventional steam turbines. The latter were preferred as all machinery and boilers were sited below the pontoon deck and height was limited. Uptakes and funnels were sided to avoid impeding the clear dock space. A later addition was temporary decking spanning the dock for the stowage of motor vehicles and stores, which could be trans-shipped by crane.

In the event, the LSDs proved excessively stable and the sides below the deep waterline were flared-in, reducing also the amount of ballast necessary to trim the ship down. Though an apparently enormous volume was available for ballast space, it was scarcely adequate in practice. Flooding down usually took 1½ hours and pumping dry took 2½ hours, even at a pumping rate of 69650 litres (18,400 US gal) per minute. Initially dividing gates were provided on the pontoon deck, but the expected surge (or 'bath water effect') did not materialize. The LSD concept also provided the basis for today's RoRo cargo vessel.

Specification

LSD

Displacement: 4,270 tons standard and 7,950 tons full load

Dimensions: length 139.5 m (457.75 ft); beam 22.0 m (72.25 ft); draught 5.3 m (17.5 ft)

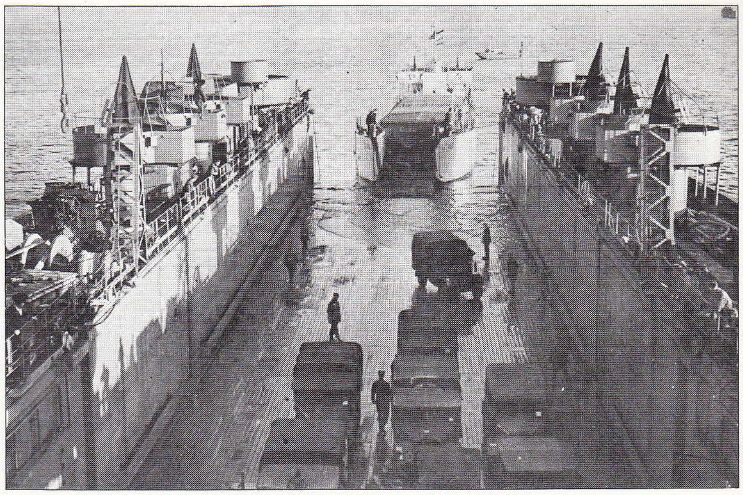
Propulsion: (LSD1-8) two sets of reciprocating steam engines delivering 8203 kW (11,000 ihp) to two shafts, or (others) two sets of geared steam turbines delivering 5593 kW (7,500 shp) to two shafts

Performance: maximum speed (LSD1-8) 17 kts or (others) 15.5 kts; range 14830 km (9,215 miles) at 15 kts

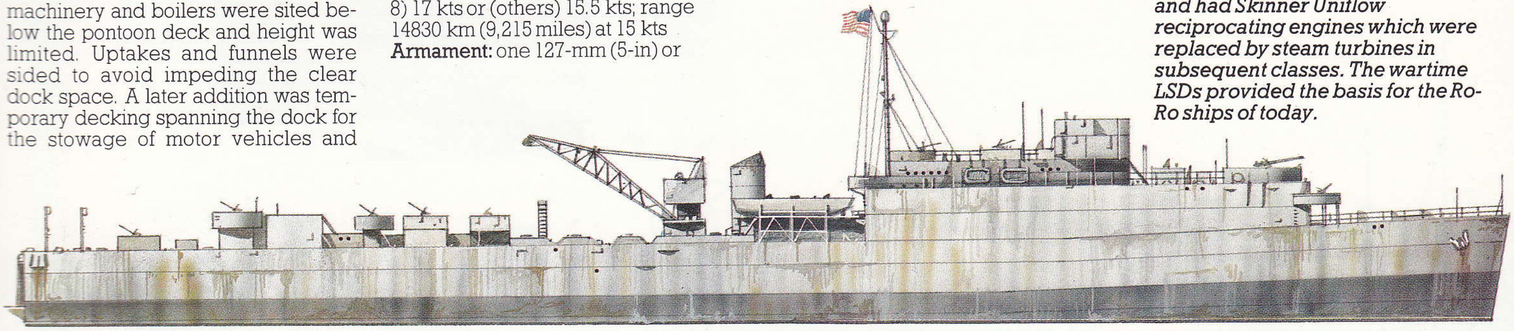
Armament: one 127-mm (5-in) or (British ships) 76-mm (3-in) DP, and six twin 40-mm AA or 16 single 20-mm AA guns

Capacity: two LCT(3)s or LCT(4)s, or three LCT(5)s, or 36 LCMs, landing craft crew (varying with landing craft carried) and 263 troops

Complement: 254



The Landing Ship, Dock was planned as a carrier for the largest LCTs, which in 1941 were still not sea-going. They had a pontoon deck big enough for two LCTs; here trucks are transferred from the LSD deck to a waiting LCT.



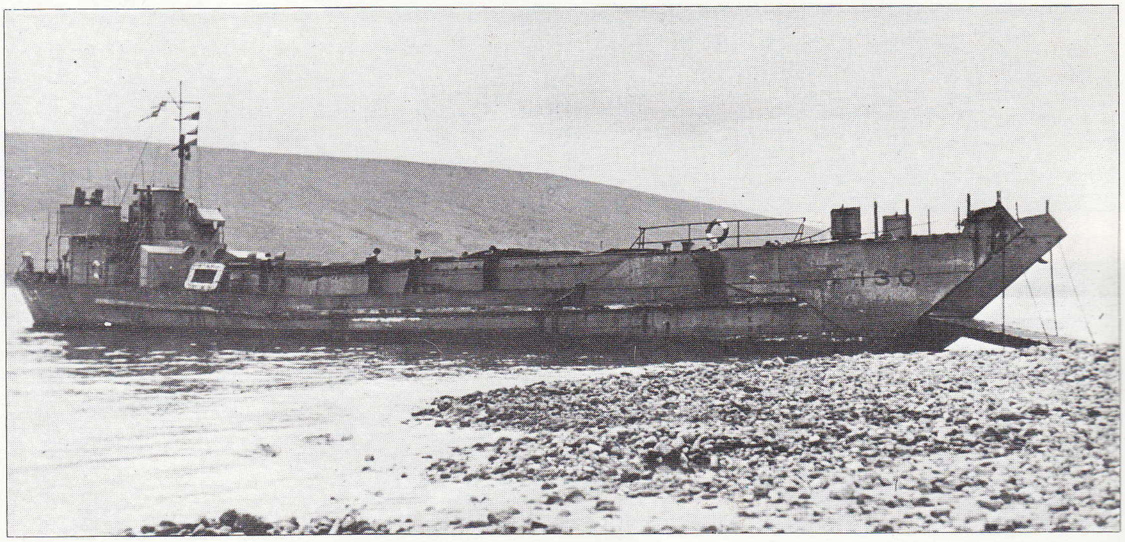
USS Belle Grove *was the second vessel of the first class of US LSDs, and had Skinner Uniflow reciprocating engines which were replaced by steam turbines in subsequent classes. The wartime LSDs provided the basis for the Ro-Ro ships of today.*

UK

Landing Craft, Tank Mks 1 to 3 (LCT (1-3))

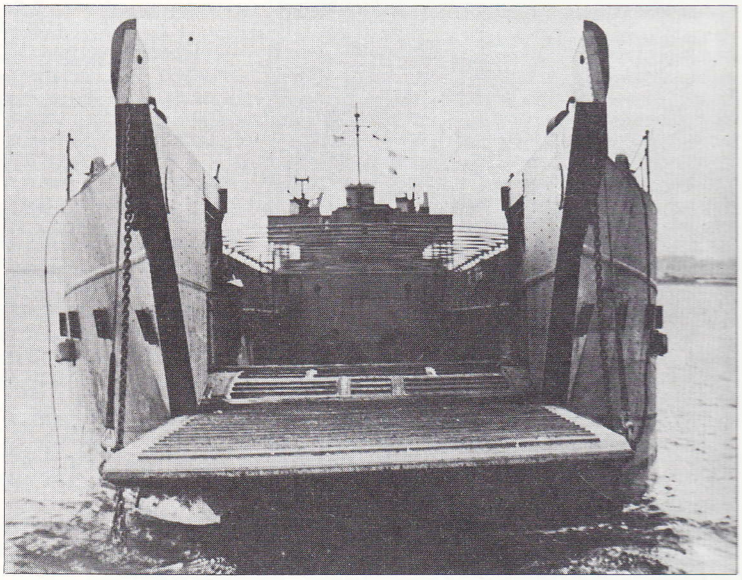
Landing craft, as opposed to landing ships, were not designed for extensive sea passages, their more limited performance being deliberately aimed at different operations. Little work had been done before World War II with respect to putting wheeled and tracked vehicles over a beach, simply because no application was then seen for it. Dunkirk and Churchill changed all that. With no previous experience as a basis, it was decided that a suitably-dimensioned craft could be built around the carriage of three 40-ton tanks, the largest then contemplated, being able to offload them in under 1 m (3.3 ft) of water on a 1 in 35 beach. **Landing Craft, Tank Mk 1** or **LCT(1)** that resulted was the first of its type anywhere and, despite its wayward course-keeping, proved remarkably sound. The reinforced tank deck was over and between heavily compartmented double skins which accommodated ballast and trim tanks, together with bunkers and stowage. Cargo was screened by high coamings on the inboard edges of the side decks; it was normally open to the sky, obviating the exhaust ventilation problems experienced by the larger ships, but could be covered with light tarpaulins spread over hatch beams. The single-element bow ramp was not particularly watertight and was backed by a pair of low watertight doors. Propulsion had to be by two of the readily available Hall-Scott petrol engines used on coastal craft but, nevertheless, achieved the required 10 kts. Most LCT(1)s were built (during 1940-1) in four sections, which could be broken down for shipment to distant parts.

Thirty LCT(1)s were built before the type was superseded by the **Landing Craft, Tank Mk 2** or **LCT(2)**. With only small increases in dimensions, these could accommodate two rows of smaller tanks and increase endurance from 1665 to 5000 km (1,035 to 3,110 miles).



After Dunkirk a requirement was issued for a craft able to land three 40-ton tanks in a metre of water on a beach with up to 2.8 per cent slope. The LCT(2)s seen above displaced 460 tons loaded and could carry up to seven 20-ton tanks.

Three engines were fitted, petrol or diesel as available. For the first time the design lent itself to construction by general steel fabricators, relieving the load on shipyards. To increase capacity yet further, a fifth midbody section was then inserted to create the **Landing Craft, Tank Mk 3** or **LCT(3)** with a length of 58.52 m (192 ft). These could carry five heavy or 11 medium tanks for very little extra draught and, despite reversion to twin-screw propulsion, were only marginally slower.



LCT(3)s were essentially LCT(2)s with a 9.75-m (32-ft) section added amidships, enabling them to accommodate up to five 40-ton or 11 30-ton tanks. Later units were fitted with petrol engines giving a maximum speed of 10 kts.

Specification

LCT(1)

Displacement: 226 tons light and 372 tons loaded

Dimensions: length 46.3 m (152 ft); beam 8.8 m (29 ft); draught 0.9/1.75 m (3/5.75 ft)

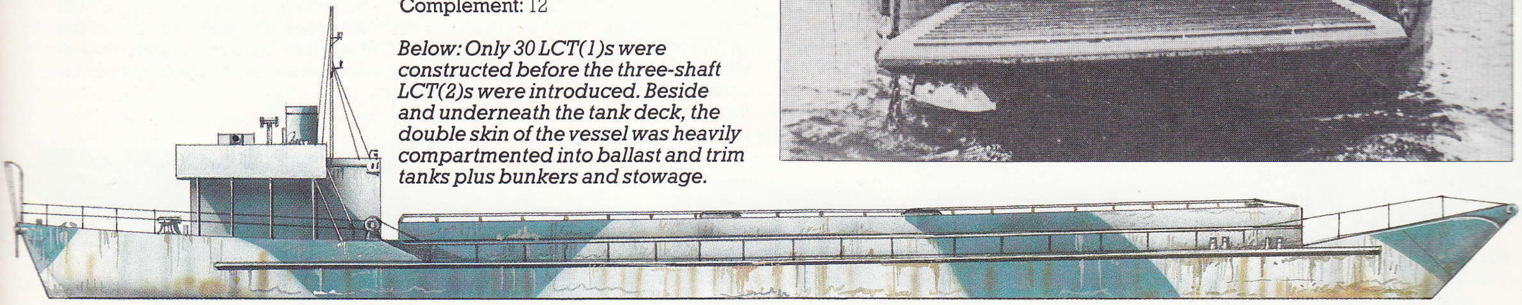
Propulsion: two petrol engines delivering 746 kW (1,000 hp) to two shafts

Performance: maximum speed 10 kts; range 1666 km (1,035 miles) at 10 kts

Armament: two single 2-pdr pompoms

Capacity: three heavy or six medium tanks

Complement: 12



Below: Only 30 LCT(1)s were constructed before the three-shaft LCT(2)s were introduced. Beside and underneath the tank deck, the double skin of the vessel was heavily compartmented into ballast and trim tanks plus bunkers and stowage.

UK

Landing Craft, Tank Mk 4 (LCT(4))

While the LCT(1), (2) and (3) were admirable in concept, they were too deep-draughted to use on French beaches, which were found to have far shallower gradients than had been suspected. At the same time, larger numbers of craft were seen as necessary, each having greater capacity. In October 1941, therefore, a new version, the **Landing Craft, Tank Mk 4** or **LCT(4)** was put into production. Again, no shipyard was involved and, to achieve the lightest possible draught, scantlings were extremely flimsy and would never have met peacetime standards. Compared with the LCT(3), the new design was a little shorter but considerably beamier; propelled by the same diesel machinery it was, therefore, considerably slower. The tank deck was sized to accommodate six heavy tanks in two rows of three, or nine medium tanks in three rows. Deadweight tonnage was about 300 and, in the loaded condition, the craft could beach successfully on a 1 in 150 slope, putting wading vehicles down in the specified depth of only 76 cm (30 in) of water.

To simplify production, the 865 planned craft were initially specified without armament, but this was very soon added once they were completed. The side coamings were comparatively shallow so that the stowage space could not be covered, as in the earlier types and, more importantly, it lacked sufficient longitudinal stiffness. With the first craft entering service in the autumn of 1942, it was already realized that they would eventually be required to operate in the Far East, where sea passages would be expected of them. Extra stiffening was, therefore, incorporated by bringing the shell plating up to the height of the coaming, effectively creating a box section of maximum depth, using heavier plate where appropriate. These measures did nothing for their draught figures but did enable them to proceed to the Indian Ocean on their own bottoms. Some were converted to **Landing Craft, Flak Mk 4** or **LCF(4)** by the addition of four 2-pdr pompoms and eight 20-mm Oerlikons, or **Landing Craft, Gun Mk 4** or **LCG(4)** with two 119-mm (4.7-in) guns from old destroyers and up to a dozen 20-mm weapons.

Specification

LCT(4)

Displacement: 200 tons light and 586 tons loaded (or 611 tons when stiffened)

Dimensions: length 57.1 m (187.25 ft); beam 11.8 m (38.7 ft); draught 1.1/1.4 m (3.5/4.7 ft)

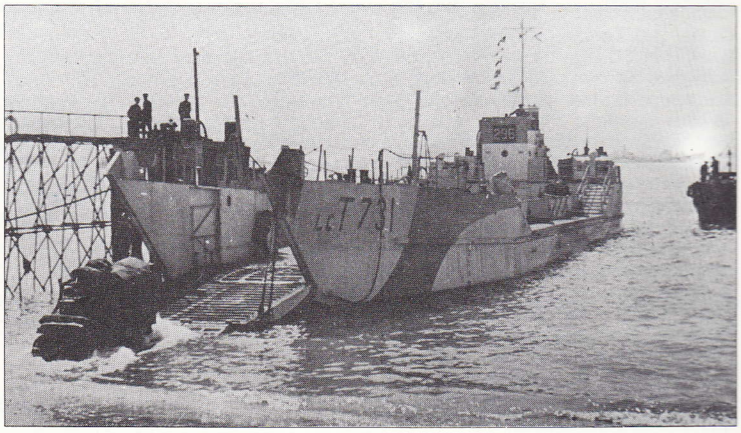
Propulsion: two diesels delivering 686 kW (920 bhp) to two shafts

Performance: maximum speed 9 kts; range 2035 km (1,265 miles) at 8 kts

Armament: up to two single 20-mm AA guns

Capacity: six heavy or nine medium tanks

Complement: 12



Above: LCT(4)s were developed because the earlier LCTs were of too deep a draught for the French beaches on which the Allies intended to land.

Below: Compared to the LCT(3)s the LCT(4)s were beamier and a little shorter. Their shallow draught enabled them to beach on a 1 in 150 slope, putting vehicles ashore in less than a metre of water.

UK/USA

Landing Craft, Tank Mks 5 to 8 (LCT 5-8))

As World War II proceeded, it became apparent that the draught problem would inhibit the use of LSTs in some instances and the British proposed a short, beamy, drive-through craft (another new concept) that could either ferry the LSTs' vehicles ashore (a slow process for a landing) or act as a temporary bridge to link the large vessel to the beach. The result was the **Landing Craft, Tank Mk 5** or **LCT(5)**, which could either be transported in sections to a desired theatre and assembled afloat, or actually transported complete on an LST's upper deck and launched by simply sliding all 134 tons of it over the side. She was a slow short-haul craft and nearly 500 were built in the USA with a conventional layout before the **Landing Craft, Tank Mk 6** or **LCT(6)** was introduced on much the same dimensions but finally with the bridge on the starboard side to permit the earlier-proposed drive-through operation. Triple-screw propulsion suited the diesels available and improved the craft's handling somewhat.

Some LCT(5) and (6) vessels supplied to the British were subsequently lengthened by about 12 m (39.4 ft). At about this same time in 1943 the Americans designed their first large craft from scratch, designated the **Landing Craft, Tank Mk 7** or **LCT(7)** for a time but then, as a blend of LCT and LST, known as an **LSM (Landing Ship, Medium)**. Though larger than an LCT(3), it had finer lines and a ship-type bow with vertically-hinged doors to be capable of ocean passages at 12 kts. As a result, its capacity was a reduced three heavy or five medium tanks and its draught increased. The LSM had a characteristically high tower of a bridge, set amidships on the starboard side, and enclosed accommodation for over 50 troops.

The LSM was not suitable for use by the British who, nevertheless, used the basic idea for their final **Landing Craft, Tank Mk 8** or **LCT Mk 8**. At 68.6 m (225 ft) this was limited to eight medium tanks. The production of LCT(8)s with their four-diesel, two-shaft drive and improved facilities could be undertaken only because of the relaxing of supply problems near the war's end.

Specification

LCT(7) or LSM

Displacement: 513 tons light and 900 tons full load

Dimensions: length 62.0 m (203.5 ft); beam 10.4 m (34 ft); draught 1.0/2.1 m (3.4/6.9 ft)

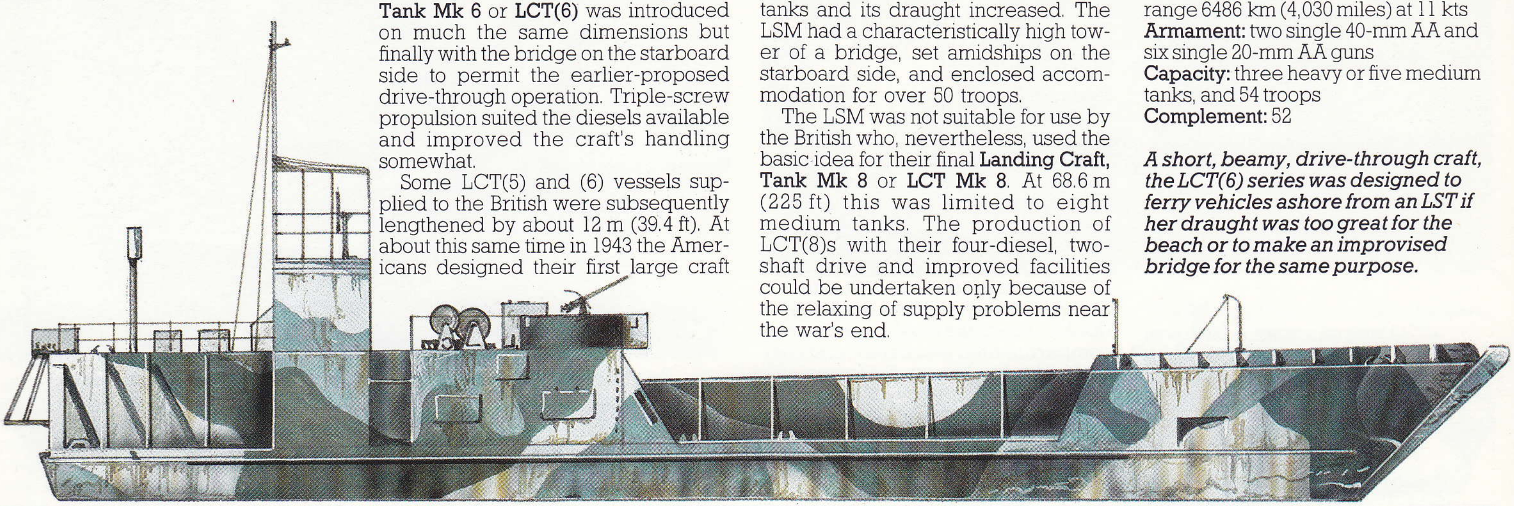
Propulsion: two diesels delivering 2088 kW (2,800 bhp) to two shafts

Performance: maximum speed 13 kts; range 6486 km (4,030 miles) at 11 kts

Armament: two single 40-mm AA and six single 20-mm AA guns

Capacity: three heavy or five medium tanks, and 54 troops

Complement: 52



A short, beamy, drive-through craft, the LCT(6) series was designed to ferry vehicles ashore from an LST if her draught was too great for the beach or to make an improvised bridge for the same purpose.

UK/USA

Landing Craft, Infantry Large and Small (LCI(L) and (S))

First described as a **Giant Raiding Craft**, the **Landing Craft, Infantry (Large)** or **LCI(L)** was a relatively fast craft designed around the carriage of 210 troops on sea crossings of up to 48-hour duration. The type was first mooted in 1942 for general raiding around the coast of occupied Europe and, as the troops needed to get ashore rapidly, a gangway (or 'brow') was included on either bow. Once lowered, these were required to put the troops down in water shallow enough to wade ashore. In turn, this demanded such a shallow beaching draught forward as to necessitate steel, rather than wood construction. For this reason, the LCI(L) was American-built to British requirements. From **LCI(L) 351** onwards, a centreline bow ramp operating through bow doors was adopted (though not universally), more protective for the troops but more vulnerable mechanically. As it did not carry vehicular cargo, the LCI(L) was comparatively finely built, with a ship-type bow.

The propulsion system was typically a product of war ingenuity, with eight General Motor diesel truck engines driving the twin shafts through rubber friction rollers. Numbers up to LCI(L) 1139 were allocated, though few over 900 were completed as designed. Over 300 further hulls were completed for special roles, notably over 160 armed as inshore fire support craft. Though known as **Landing Craft, Infantry (Gun)** or **LCI(G)**, i.e. gunboat, many of these had 127-mm (5-in) rocket-launchers or mortars.

Complementing the LCI(L) in its raiding role was the **Landing Craft, Infantry (Small)** or LCI(S) though neither type is believed ever to have been used as intended. As only half the number of troops was carried, the originally-planned wood construction was adopted, the design being the responsibility of Fairmile, which mass-produced them after the manner in which they built so many coastal forces craft. The double-diagonally laid plywood of much of the craft's external surfaces was overhung with 6.4-mm (0.25-in) HT steel plate for added protection, but troops below still incurred many casualties on approach to landings where they were finally used. No less than four brows were arranged forward, together with a (typically British) stowage for 12 bicycles. Propulsion was by a pair of the well-tried Hall-Scott petrol engines, and the craft were capable of 15 kts when these were turbocharged.

Specification

LCI(L)

Displacement: 246 tons light and 384 tons full load

Dimensions: length 48.9 m (160.3 ft); beam 7.2 m (23.5 ft); draught 0.9/1.6 m (2.9/5.25 ft)

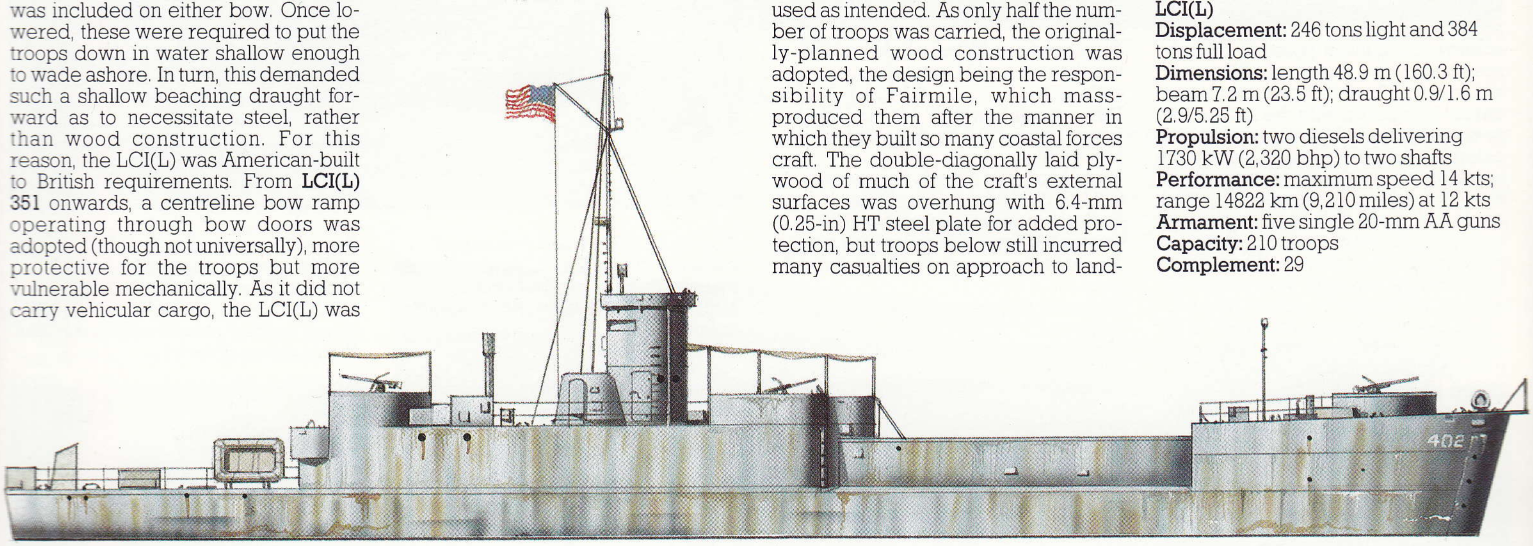
Propulsion: two diesels delivering 1730 kW (2,320 bhp) to two shafts

Performance: maximum speed 14 kts; range 14822 km (9,210 miles) at 12 kts

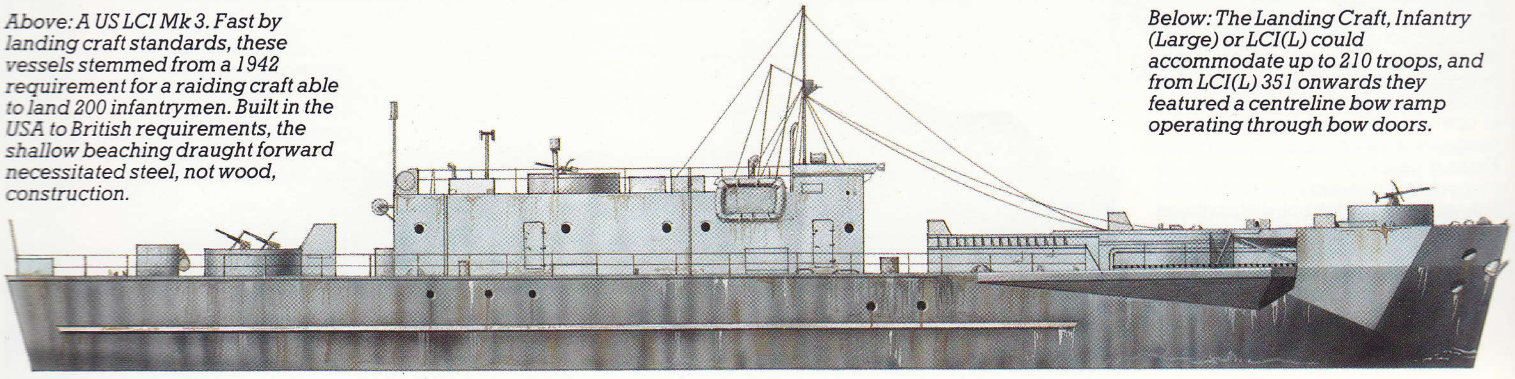
Armament: five single 20-mm AA guns

Capacity: 210 troops

Complement: 29



Above: A US LCI Mk 3. Fast by landing craft standards, these vessels stemmed from a 1942 requirement for a raiding craft able to land 200 infantrymen. Built in the USA to British requirements, the shallow beaching draught forward necessitated steel, not wood, construction.



Below: The Landing Craft, Infantry (Large) or LCI(L) could accommodate up to 210 troops, and from LCI(L) 351 onwards they featured a centreline bow ramp operating through bow doors.

The Invasion of Sicily

Operation 'Husky', the Allied invasion of Sicily in July 1943, was the largest amphibious operation to date, involving 160,000 men and over 2,500 ships. The potentially powerful Axis defences were not expecting an attack in such bad weather, which meant that the landings could be carried out successfully despite 200 landing craft being put out of action by the heavy seas.

Throughout the morning of 9 July 1943, the invasion fleets steamed past Malta, those carrying the US 7th Army under command of Lieutenant General George Patton on the west of the island, those carrying the British 8th Army under General Sir Bernard Montgomery on the east. Some 2,500 ships and landing craft escorted or were carrying 160,000 men, 14,000 vehicles, 600 tanks and 1,800 guns in what was to that date the largest amphibious operation in history, due within hours to enter waters heavily mined and possibly guarded by U-boats, threatened by the existence of large enemy battlefleets well within striking distance as well as both German and Italian air squadrons operating from shore bases.

Upon reaching the shores of Sicily the armies would storm open beaches, and in order to occupy the entire island they must defeat an enemy force of nearly 300,000 of whom 40,000 were German veterans of the 15th Panzer Grenadier Division and the 'Hermann Goering' Panzer Division.

During that day, as the huge concourse of ships moved slowly past the badly battered island of Malta, the wind rose steadily in a typical Mediterranean summer storm and by evening had reached gale force; aboard the crowded transports sea-sickness claimed victims at every rank, the heaving decks were slimy with vomit, and an overpowering stench filled the holds as the sailors fought their way between the sweating, khaki, groaning soldiers, to help when they could and to work the ship all the time. Back at his headquarters in Malta, General Dwight D. Eisenhower watched the maps, listened to the weather reports and to the advice from the naval staff, and at the crucial moment took his own counsel. Then he nodded: despite the weather, the operation would go on.

On crowded airfields in Tunisia, the engines of 109 American Douglas C-47s and 35 British Armstrong Whitworth Albemarles were warming up and their crews climbing board, while behind each plane was linked a Waco or Horsa glider packed with the 1,500 officers and men of the British 1st Airlanding Brigade. Just before 19.00 the aircraft began to take off, flying at first into clear evening air. But by the time they were approaching Malta for their assembly and turning point the sky had darkened, they were into the gale centre and the winds were driving the planes off course and buffeting the gliders.

Two hours after the British airborne forces had taken off, another 222 C-47s filled with 3,400 American paratroops had taken off from Tunisian airfields, soon to find themselves in the same chaos and disorder as that which was engulfing the British brigade. Nearly 40 of the tows of the combined force wisely turned back, but only 54 of the British gliders landed in Sicily, the rest going down into the sea with the cargoes drowned; the American paratroops were dropped into Sicily, but only some 200 were anywhere near their objectives, and for some hours their commander, Major General James Gavin, was under the impression that he had been dropped into mainland Italy.

All the C-47s had turned back towards North Africa by 22.00, and those that had not been shot down or ditched because of mechanical failure were back at their bases well before midnight; and about an hour before midnight the wind died away even more quickly than it had arisen and calmness reigned. The ships carrying the 8th Army were now approaching their landing beaches more or less on time, while those bearing the 7th Army, with farther to go and the remnants of the gale blowing on the south western shores still to handle, were about an hour late.

The Italian units along the stretch between Cape Passero and Syracuse had decided that no one in their senses would attempt a seaborne landing in such weather and had relaxed their attention once the Allied aircraft had flown off, so the first waves of the British assault landed without opposition and swept over the coastal defences almost before their presence was noticed. Belatedly, a few inland artillery units opened fire on the invasion beaches, to be blanketed immediately with shells from one or more of the six battleships (*Nelson, Rodney, Warspite, Valiant, Howe* and *King George V*) which had accompanied the force for just this purpose.

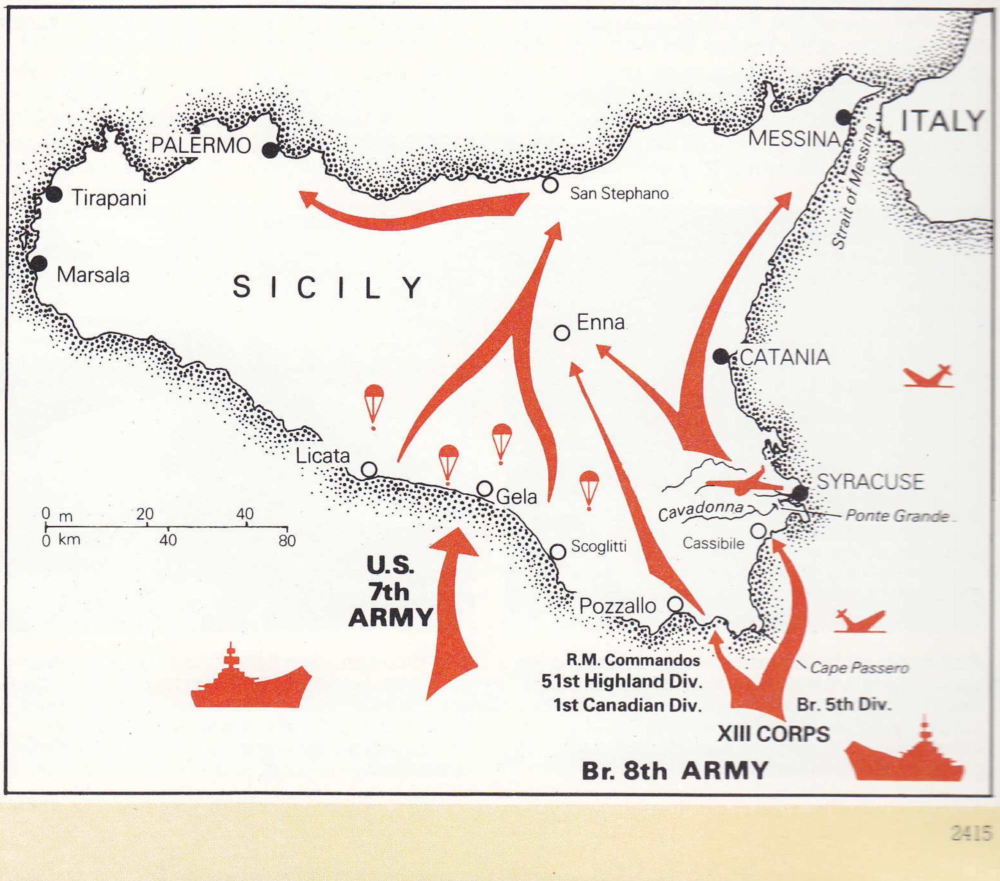
Lieutenant General George S. Patton, commander of the US 7th Army, wades ashore, pearl-handled revolver strapped to his hip, characteristically preceded by a cameraman.

The fall of Cassibile

Shortly after dawn on 10 July advanced units of the British 5th Division were approaching Cassibile and by 08.00 the town was in their hands, the whole of the British XIII Corps was coming ashore to the south of the division while the 51st (Highland) Division and the 1st Canadian Division of XXX Corps, with Royal Marine Commandos on their western flank, were ashore around the corner of Cape Passero, between the point and Pozzallo.

Farther to the west, the US 7th Army had not been quite so fortunate. The coastal defenders had not been asleep along their stretch, and

The airborne landings preceding the main assault were severely disrupted by the gusty winds, which reached Force 7. Many paratroops drowned after landing in the sea; others were so scattered as to be ineffective. However, the sea landings succeeded and once the German counterattack had been defeated the conquest began in earnest.



the ships and landing craft came under fire from almost the moment of their arrival. Again, fire from the heavy naval guns soon obliterated most of the opposition (much to Patton's astonishment and delight, as he had placed little reliance upon naval assurances) but the pier at Gela which would have been very useful for a quick build-up was blown to pieces by demolition charges as two Ranger battalions were actually sailing for it, and by 04.30 Italian and German aircraft were over the crowded beaches to sink two transports in an awkward position.

Forward formations ashore

But by mid-morning all the forward strike formations of the 8th and 7th Armies were ashore and probing inland, and the latter were suddenly to receive an unexpected bonus. If their airborne colleagues were not in exactly the right positions, they had coagulated during darkness into 20 or 30 independent groups and were creating chaos in the country just behind the landing beaches, cutting communications, ambushing lone cars, lorries or even small convoys, attacking crossroad guardposts and on one occasion holding up an entire Italian mobile regiment which had been sent to find out what was happening at Gela.

At the other end of the invasion beaches, however, the tiny part of the British airborne force, just 100 men which had been landed in the correct place, assumed the task of the entire 1,500-strong brigade and had rushed and taken the Ponte Grande over the River Cavadonna just south of Syracuse, and by mid-afternoon was in desperate straits. Attempts to annihilate the eight officers and 65 men on the bridge itself had begun shortly after dawn and had hardly slackened since then. Italian soldiers, marines and sailors had been sent out from Syracuse in ever-stronger waves, and by 15.00 all but 15 of the defenders had been killed or wounded, and ammunition was running low. At 15.30 a massed assault overran the survivors, but eight managed to escape and, as the British had removed all the demolition charges while in possession of the bridge, the Italian marines had now to try to emplace some more. Two of the escaping eight therefore took position half way up an overlooking hill and from here sniped at every movement on the bridge, while the remaining six, stumbling with exhaustion, made their way south towards Cassibile. Three miles along the road they met a mobile column from the 5th Division. They led this column back to the bridge, which fell immediately into British hands again, and by 17.00 the column was driving into Syracuse itself.

By the end of the first day, the British therefore held the coastal strip from Pozzallo around to Syracuse, a vital port that was in their hands and sufficiently undamaged for immediate use, while the US 7th Army held nearly 64 km (40 miles) of beach between Scoglitti and Licata. Inland, scattered bands of British and American airborne troops were loose over the southern half of the island, successfully spreading alarm and confusion.

It was not to be expected that matters would continue quite so smoothly for the Allies, especially with two highly efficient German divisions deployed against them, but the next few days saw the satisfactory development of the overall plan. The 8th Army consolidated and began its advance up the eastern coast towards Messina, while the 7th Army drove north alongside it, aiming for the northern coast near San Stephano and at the same time guarding the inner flank of the British advance.

Within 10 days Canadian units had reached Enna in the centre of the island, and two days later Patton's troops had not only reached the north coast but had turned west and occupied Palermo, taking prisoner thousands of Italian soldiers who were more than happy to stop fighting, and being welcomed everywhere by delighted Sicilians to whom quite a number of the Americans soldiers were related. Very soon it became evident that the bulk of the inhabitants of the Italian mainland felt the same way.

A view from the ramp: unloading stores on Bren gun carriers on to a Sicilian beach. By the end of the first day the British 8th Army held a line from Pozzallo to the vital port of Syracuse, and the US 7th Army was deployed along 64 km (40 miles) of coast from Scoglitti to Licata.

Half-tracks of the US 2nd Armoured Division drive up the beach at Licata from the capacious deck of an LST. The 2nd Division took Licata on the first day, and observed the German 15th Panzergrenadier Division north of Canicatti preparing to counterattack Gela.

The 'Brooklyn' class light cruiser USS Boise *steams across the bow of LST-325, treating the defenders of Sicily's southern coast to the full benefit of her forward six-inch guns. Naval gunfire helped ensure that the naval landings met with only light opposition.*

A motley column of Italian prisoners of war is shepherded along the beach in front of the amphibious armada lying off shore. The Allied landings in Sicily convinced many Italians that the war was lost and that continued support for Il Duce would be both futile and dangerous.

UK/USA

Landing Craft, Mechanized Mks 1 to 7 (LCM (1-7))

Motor Landing Craft (MLC) had been the subject of experiments in various guises by the British as far back as 1926, but the true progenitor of the species was *MLC10*, completed in 1929. She was a 12.8-m (42-ft) craft capable of beaching with a 12-ton tank. An interesting feature contributing to her low draught was water-jet propulsion, although the low efficiency of units at this time resulted in a speed of barely 5 kts. Developed from this modest prototype, Thornycroft completed in early 1940 the first **Landing Craft, Mechanized Mk 1** or **LCM(1)**, slightly longer and able to carry a single 14-ton tank. Screw propulsion was used, and this increased speed by 50 per cent. Well described by its designer as a 'powered pontoon with bulwarks', this little craft could be hoisted under heavy davits even when loaded. Trials were not even complete when Dunkirk stimulated an order for two dozen more. Eventually about 500 LCM(1)s were constructed, largely by railway workshops.

While these activities were in progress, the US Marine Corps had its own specification prepared for a similar type of craft. This was based on the hull of an up-river, shallow-draught tug and became known as the **LCM(2)**. The craft were very close to the British craft in both layout and performance, even to the unloved petrol engine propulsion. About 150 were built before an improved 15.24-m (50-ft) version was produced at the suggestion of the British, increasing its capacity from a single 16-ton tank to one of 30 tons. An immediate success, the **LCM(3)** ran to over 8,600 craft, built from 1942 to 1945. Two distinct types, the **'Bureau'** and the **'Higgins'**, were built by the Americans to the same specification.

The **LCM(4)** and **LCM(6)** were essentially the same craft, an LCM(3) with an extra 1.83-m (6-ft) section added amidships for extra capacity, and some 2,700 were built. The **LCM(5)** was stillborn, but the British-built **LCM(7)**, which first appeared late in 1944, was really a further-enlarged LCM(3) aimed primarily at operations in the Far East. Its length was over 18.3 m (60 ft), but it had the size for versatility, being used also in a wide variety of (chiefly unofficial) gunboat guises for fire-support purposes.

Specification

LCM(3)

Displacement: 23 tons light and 52 tons full load

Dimensions: length 15.2 m (50 ft); beam 4.3 m (14.1 ft); draught 1.0/1.3 m (3.25/4.25 ft)

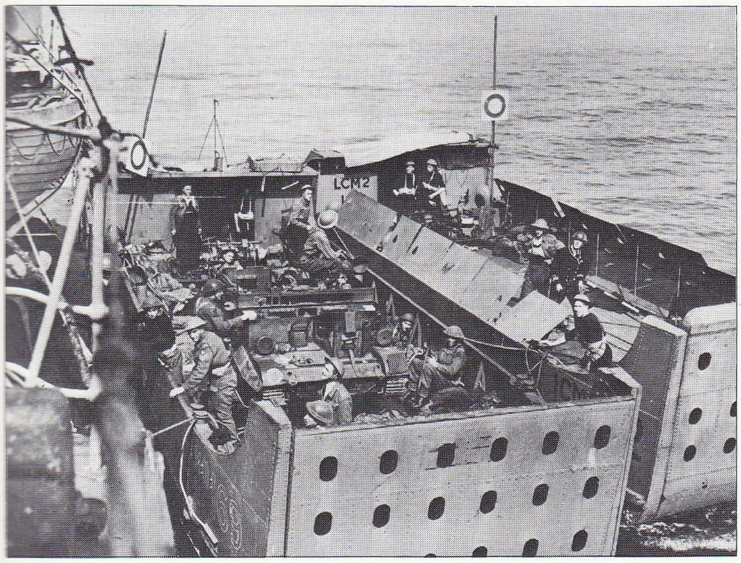
Propulsion: two diesels delivering 164/336 kW (220/450 bhp) to two shafts

Performance: average speed about 8.5 kts; range 1577 km (980 miles) at 6 kts

Armament: one twin 12.7-mm (0.5-in) machine-gun

Capacity: one medium tank or 60 troops

Complement: 4



Thornycroft completed the first LCM in 1940, describing it as a 'powered pontoon with bulwarks'. Able to carry a 14-ton light tank, it could be hoisted under davits even when loaded.

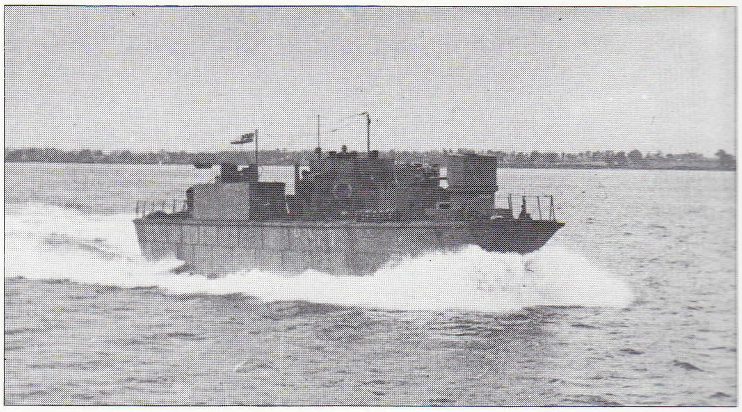
The US LCM(2)s were based on the design of shallow-draught up-river tugs. This LCM(2) is being used by men of the 30th Infantry Division during the Rhine crossings in March 1945.

UK/USA

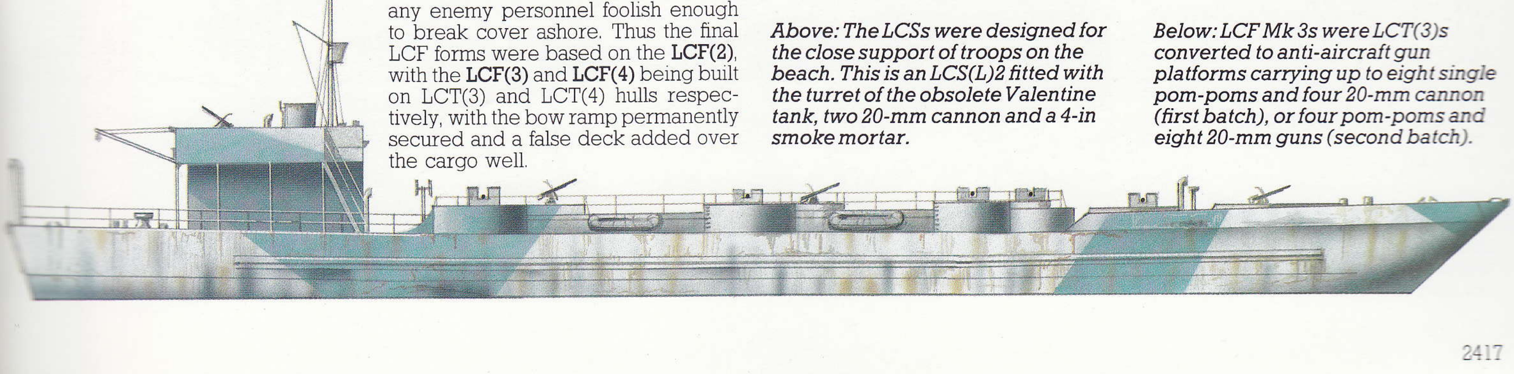
Landing Craft, Flak (LCF) and Landing Craft, Support (LCS)

Not all landing craft were used for the carriage of men or machinery: a goodly number were converted to auxiliary, if unorthodox, warships. Some, the **Landing Craft, Flak** or **LCF** type, were produced to give AA protection where sufficient regular navy back-up was likely to be lacking, while the **Landing Craft, Support** or **LCS** was able to go right inshore to render direct support to personnel actually on the beach, particularly in the awkward gap between the main 'softening-up' barrage lifting or rolling forward and the assault troops actually touching down and getting off the beach.

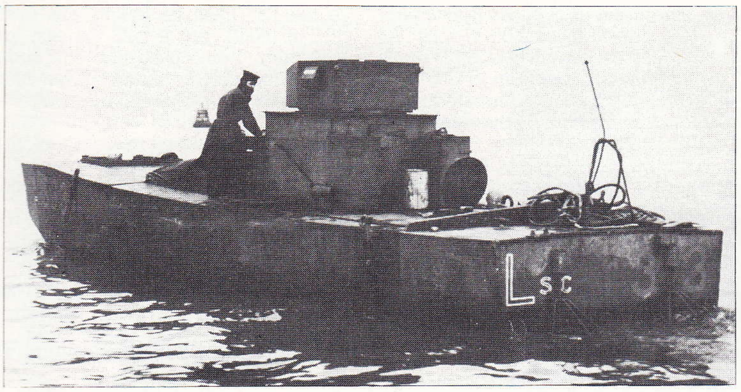
Two prototype LCFs were produced from LCT(2) hulls in late 1941. The first was a 'Rolls-Royce' with two twin 102-mm (4-in) HA mountings and three 20-mm guns. Besides the work involved, which was considerable, these mountings were already in great demand for a wide range of escort ships, the LCT structure was inherently flimsy and, last but not least, the low-sited director in combination with ship motion made for poor accuracy. More realistically, the LCT(2) took eight single 2-pdr pompoms and four 20-mm guns. Such mountings were more easily come by and could not only hose out a reassuringly large volume of fire against aircraft, but could also work devastatingly against any enemy personnel foolish enough to break cover ashore. Thus the final LCF forms were based on the **LCF(2)**, with the **LCF(3)** and **LCF(4)** being built on LCT(3) and LCT(4) hulls respectively, with the bow ramp permanently secured and a false deck added over the cargo well.



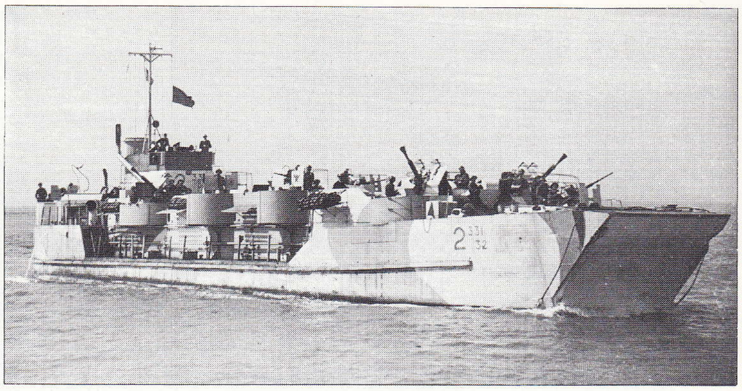
Above: The LCSs were designed for the close support of troops on the beach. This is an LCS(L)2 fitted with the turret of the obsolete Valentine tank, two 20-mm cannon and a 4-in smoke mortar.



Below: LCF Mk 3s were LCT(3)s converted to anti-aircraft gun platforms carrying up to eight single pom-poms and four 20-mm cannon (first batch), or four pom-poms and eight 20-mm guns (second batch).



The LCS(M)2s were built to provide close support for the LCAs during the approach to the beach. They carried a pair of 4-in (100-mm) machine-guns and a smoke mortar.



A Landing Craft, Flak displays an impressive selection of automatic weapons: visible are 2-pdr pom-pom single mounts, and much smaller 20-mm (0.78-in) cannon.

A further refinement was the LCS which carried, either singly or in combination, a medium-calibre weapon for tackling enemy armoured vehicles, or mortars to engage enemy infantry who, all too frequently, were dug-in behind the rise that backed the beach, virtually safe from close range low-trajectory fire. LCS(S)s were actually converted from the fairly fast but wooden-hulled LCI(S) which, rather quirkily, were equipped with British armoured tank turrets containing a 6-pdr gun or, in the American case, with heavy and light machine-guns, and racks for light rockets.

Specification

LCF(3)

Displacement: 420 tons light and 515 tons full load

Dimensions: length 58.1 m (190.75 ft); beam 9.4 m (31 ft); draught 1.1/2.1 m (1.75/7 ft)

Propulsion: two diesels delivering 746 kW (1,000 bhp) to two shafts

Performance: maximum speed 9.5 kts; range 2688 km (1,670 miles) at 8.5 kts

Armament: eight single 2-pdr pompoms and four single 20-mm AA guns

Complement: 68

UK

Landing Craft, Assault (LCA)

'Like floating bootboxes pretending to be motorboats, mere square shells for carrying troops' is a description of a **Landing Craft, Assault (LCA)** by one who spent the war in landing craft. The LCA was one of the smallest of the practical, mass-produced craft arising from a specification written by the British Landing Craft Committee in 1938, calling for a craft which, with a loaded weight of under 10 tons, should be capable of being slung under a liner's davits. It should be able to carry an army platoon fully equipped and land the men in less than 0.5 m (19.7 in) of water. Two prototypes were built, one of aluminium alloy and one of wood with protective plating. These (originally called **Assault Landing Craft**) gave experience for the final design, whose wooden construction allowed them to be built by a wide variety of concerns.

Troops along both sides sat covered from the worst of the elements, but a centreline row had to tolerate both wetness and the inevitable sea sickness. In any sea, the LCA could make little way and passage times could be protracted when a friendly tow was not available. The low, protected steering position was sited forward and on the starboard side, immediately abaft two-element armoured doors which kept out the water from the leaky bow ramp, while protecting the troops within from end-on fire during the approach to the beach.

An interesting variant was the **LCA(HR)**, the suffix standing, for Hedgerow, four rows of six mortars which laid their bombs in lanes across the beach to explode any buried mines. The craft were little modified for the function and life could be quite exciting for their crews. Equivalent American designs were the 11.05-m (36.25-ft) **LCV** and **LCVP (Landing Craft, Vehicle and Landing Craft, Vehicle/Personnel)**.

Specification

LCA

Displacement: 10 tons light and 13 tons full load

Dimensions: length 12.6 m (41.5 ft); beam 3.0 m (10 ft); draught 0.5/0.7 m (1.75/2.25 ft)

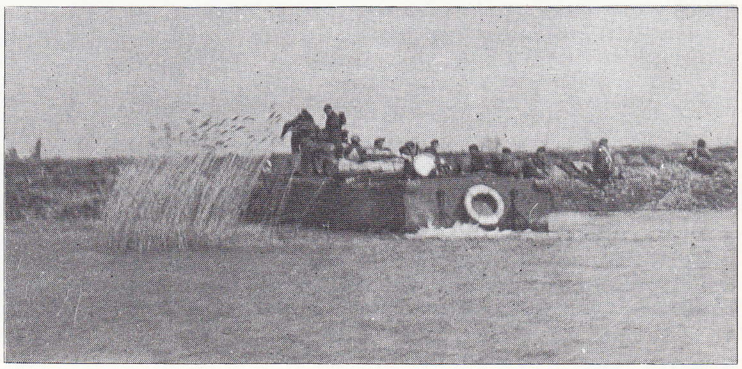
Propulsion: two petrol engines delivering 97 kW (130 bhp) to two shafts

Performance: maximum speed 7 kts; range 95-150 km (59-93 miles) depending on sea conditions

Armament: two or three machine-guns

Capacity: 35 troops with 363 kg (800 lb) of equipment

Crew: 4



A Royal Marine LCA disgorges its troops during the crossing of the river Maas. Specifications for these 10-ton mass-produced craft dated from the deliberations of the 1938 Landing Craft Committee.

LCAs assemble for an inspection by HM The King. In any sea the LCA could make little progress, and a tow was always preferred. In ideal conditions they could make 7 kts.

Axis Assault Vessels

While the prospect of an invasion of Britain loomed large in German minds in the summer of 1940, they never really came to grips with the problems of large-scale amphibious operations. The Japanese, by contrast, had from the very beginning realized the importance of amphibious warfare in any future acquisition of territory among the myriad islands of the Pacific.

Designed to operate in supplying isolated island garrisons in the south west Pacific, the T1 class suffered as did the rest of the navy. Only four survived.

Both the Germans and Japanese developed a variety of vessels capable of being used in amphibious warfare, and these make interesting contrasts with equivalent British and American craft. Only one major landing was made by the Germans over any distance, the assault on Norway in April 1940. As the country was neutral, with very weak defences, it was possible to land picked troop detachments from warships, simultaneously and by surprise, in each major port. Once seized, these ports could immediately handle orthodox transports carrying reinforcements, transport and equipment. In short, it was not an amphibious assault against prepared defences, as would have been the case in the planned invasion of the UK. 'Planned' is not the best of words as the operation had not been contemplated pre-war and the resultant sea transport was totally inadequate. Following the seizure of beach-heads by assault troops, the follow-up wave depended upon about 2,000 inland waterway barges. While admirable for their designed purpose, these barges were in no way fit for an opposed short-sea crossing. They had low freeboard, enormous hatches with weak wooden covers, and cavernous, unobstructed holds with no double bottom or cellular sides. While brows could be fitted for off-loading troops, a bow door was a different matter, opening onto a 'tank deck' that was well below waterline. Once holed, they would have foundered rapidly. Any assault depending upon such craft would have required total air superiority to ensure the Royal Navy's absence, and close to the shores of England this was a virtual impossibility.

Once Operation 'Sea Lion' was abandoned the Germans had no further obvious commitment to mounting a major assault landing, and the only true landing craft developed was based closely on the Allied LCM. In place of the slow LCA the Germans preferred to put their spearhead troops ashore from wooden-built *Sturmboote* of 6- or 14.5-m (19.7- or 47.6-ft) length. Of these, the larger was capable of carrying 40 equipped men at 25 kts.

The F-lighter

There were two types of vehicle carriers, used widely as general-purpose utility craft. The sea-going type was the MFP, or *Marine Fahrprahm*. It was known to the Allies as the F-lighter and was commonly met in the Mediterranean, to which it was transported in sections for assembly. Some 50 m (164 ft) long, it drew only 1.5 m (4.9 ft) of water. It had a miniscule superstructure aft, forward of which was a long well flanked by comparatively high coamings and accessible via a bow ramp. The F-lighter could carry a gun as powerful as an 88-mm (3.46-in) Flak, together with numerous light automatic weapons. Doubling as cargo-carrier and escort, it was regularly encountered in the Aegean and the Adriatic, being greatly respected by Allied coastal craft as its firepower was complemented by virtual immunity to torpedo attack because of its shallow draught.

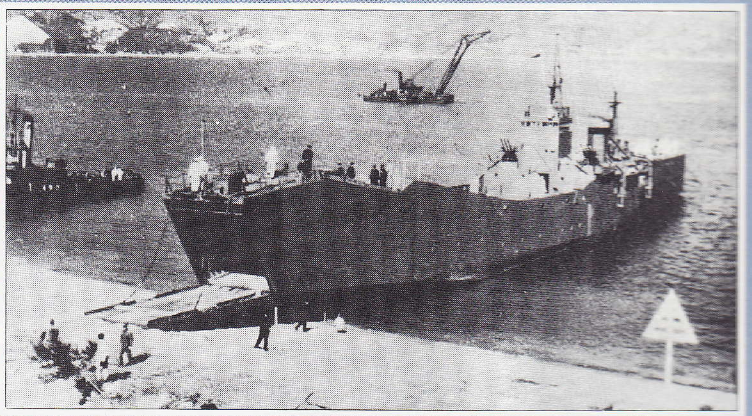
Though strictly speaking a riverine craft, the Siebel ferry was also met in sheltered open waters. It was a simple vessel, two powered pontoons bridged, catamaran-style, by a rectangular vehicle deck some 27 by 14.5 m (88.6 by 47.6 ft) in extent. Very effective but slow, it could carry up to 100 tons at 9 kts under favourable conditions. Its typical armament of two quadruple 20-mm cannon mountings was usually considerably augmented by the heavier weapons of vehicles in transit and, like the F-lighters, it could give an MGB a hard time.

As a maritime power with a wide sphere of interest, Japan had devoted considerable pre-war thought to the problems of transporting an army by sea. An early success was the ubiquitous 'Daihatsu', a powerfully fendered, flat-bottomed barge with a bow ramp and a sheerline obviously derived from fishing craft. It came in various lengths between 10 and 17 m (32.8 and 55.8 ft), equivalent to the Allies' LCAs and LCMs. The workhorse was the 14-m (45.9-ft) type, large enough to lift a light armoured vehicle, 10 tons of cargo or 70 equipped men. Powered by a variety of diesels and petrol engines, the barges were good for 7 or 8 kts and were built literally in their thousands, their patient plodding becoming essential to the Japanese island garrisons. Their 'milk-runs' involved lying concealed by day and running by dark, an endless flow that was fiercely contested by the Americans but never fully suppressed.

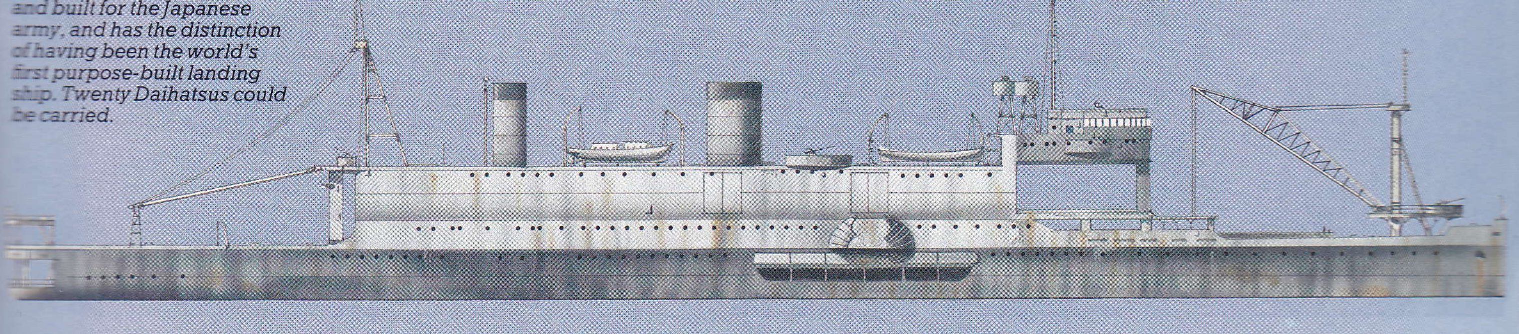
As early as 1935 the Japanese had produced in the odd-looking *Shinshu Maru* and her derivatives the world's first examples of seagoing ships designed to carry landing craft in numbers. Twenty 'Daihatsus' could be stowed inboard to be launched over a stern ramp and loaded through cargo doors amidships. Though of highly original concept, they would have been of little use in an opposed landing; their success in China and during the early days of World War II was due to total local superiority.

Early attempts at an LST resulted in the 22-strong 'Koryu Maru' class, similar to 63-m (206.7-ft) engines-aft coasters but equipped with bow doors to handle up to four medium tanks and a troop detachment. Designed along conventional ship lines, however, they drew far too much water and gave way to the rakish-looking 'T101' (diesel) and 'T103' (steam) classes of LST. At 80.4 m (263.8 ft), these were shorter than their Allied equivalents while devoting proportionately more space to machinery and superstructure. Some were run by the army, others by the navy, but the 1944-5 building programme was too late in the war to be of assistance in any significant amphibious operation as, by this time, both air and sea superiority had been lost irretrievably. Their 16-kt speed made the vessels very useful in the endless transport of supplies and replacements around the island maze of the new Japanese empire and it was while engaged on these missions that the majority were sunk by US aircraft and surface ships.

A fast transport with no real Allied peer was the 'T1' type, of which 22 from a planned 46 were completed. These 1,800-tonners were 96 m (315 ft) in overall length and were unusual in having wide side decks amidships, linked to a clear afterdeck that ran in a curved slope to the water, there being no conventional transom. 'Daihatsus', amphibious tanks and midget submarines, carried as deck cargo, were simply rolled into the sea for launching, even with the ship under way. Again, it was a design of ship suitable for the small-scale operations to which the Japanese were reduced once they had lost the initiative.



T149 is seen on trials in March 1944. These landing ships were reputedly based on photographs taken by the Germans of early Allied LST operations in the Mediterranean.



Shinshu Maru *was designed and built for the Japanese army, and has the distinction of having been the world's first purpose-built landing ship. Twenty Daihatsus could be carried.*

UK

Landing Craft, Gun (LCG) and Landing Craft, Tank (Rocket) (LCT(R))

Support firepower during landings was anticipated as being in short supply so, profiting from the successful LCF conversions, 23 LCT(3)s were fitted with two single 119-mm (4.7-in) guns and recategorized **Landing Craft, Gun (Large)** or **LCG(L)**. They had ex-destroyer mountings, the latter ships having been rearmed for anti-submarine work. The guns were sited at the same level on a new upper deck with deep bulwarks, and the after weapon had only limited arcs on the beam. Range-finding was rudimentary but the craft needed to operate at some distance from the beach, firstly to gain some falling trajectory for their guns and secondly to stay out of range of enemy weapons (particularly mortars) as their ammunition stowage was considered vulnerable.

They served well in Europe, so 10 LCT(4)s were also converted. These craft were flimsier but had extra beam, making for a steadier platform. They had a simple director, with their larger guns mounted superimposed and with full blast shielding. Light armouring was also added. Unfortunately only one was completed in time for the Far Eastern war.

The **Landing Craft, Gun (Medium)** or **LCG(M)** was designed to go right in and was protected for the purpose, while carrying two army 25- or 17-pdr guns in single armoured turrets. They were considered proof against medium-calibre return fire (in fact, they were not) and were meant to engage targets on the run in, and then to flood down to reduce freeboard as far as possible and, by sitting on the bottom, shoot accurately while gaining extra protection from their submergence. Their hulls were one-offs, with a ship bow and a low initial freeboard. Their metacentric heights gave them legendary roll angles and they manoeuvred poorly.

A most spectacular modification to LCTs was to the **Landing Craft, Tank (Rocket)** or **LCT(R)**. Both LCT(2)s and LCT(3)s were used, the whole forward end looking like a vast milk crate for the launch of 792 or 1,064 127-mm (5-in) rockets. Fixed in elevation and bearing, the weapons were launched from precisely 2-mile (3.2-km) range in 24 salvoes. Ideally the bombs came down at 10-yard intervals, laying a carpet of about 17 tons of explosive over an area of 685 by 145 m (750 by 160 yards) of the enemy defences. One set of reloads was carried and, this fired, the craft disposed of her launchers and did duty as a ferry.

Specification

LCG(L) Mk 3

Displacement: 495 tons full load

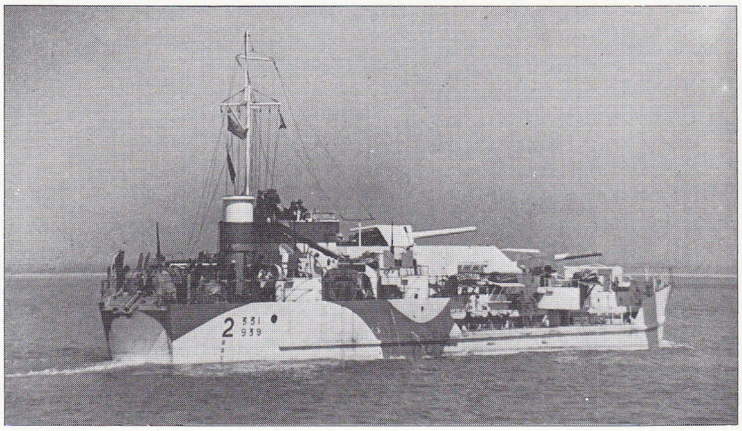
Dimensions: length 58.5 m (192 ft); beam 9.4 m (31 ft); draught 1.1/1.8 m (3.5/6 ft)

Propulsion: two diesels delivering 746 kW (1,000 bhp) to two shafts

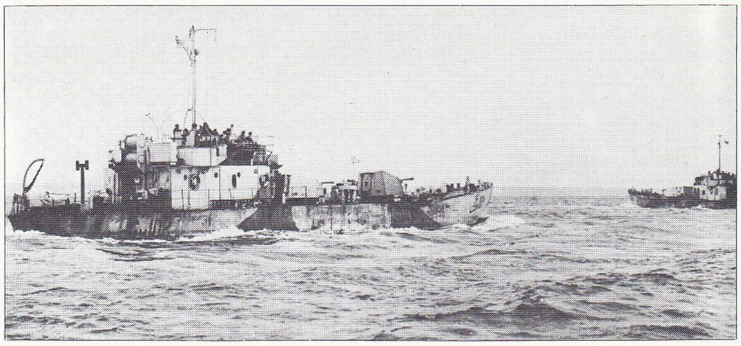
Performance: maximum speed 10 kts; range 2688 km (1,670 miles) at 8.5 kts

Armament: two single 119-mm (4.7-in) and one or two twin 20-mm AA guns

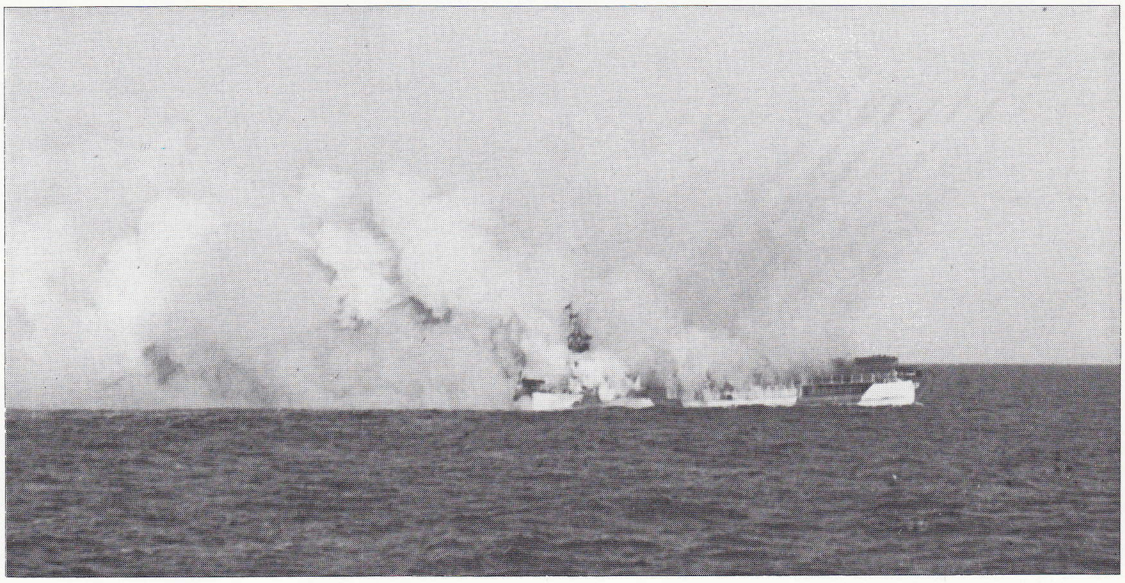
Complement: 47



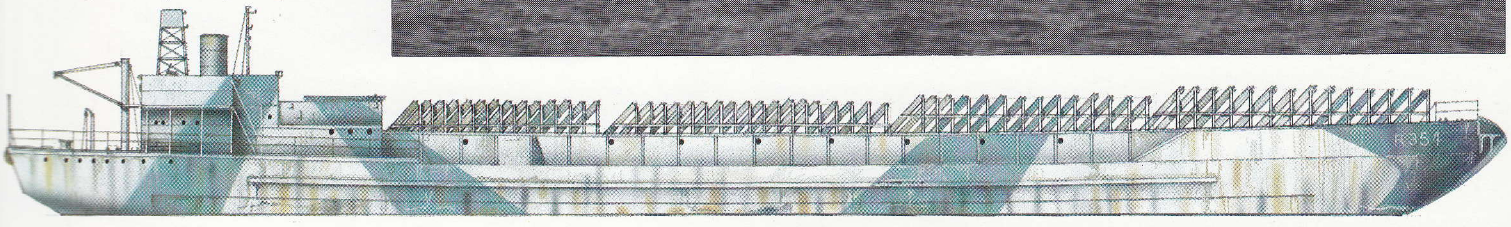
Converted from LCT(3)s or LCT(4)s, the Landing Craft, Gun (Large) or LCG(L) was designed to provide close-in fire support to an amphibious landing, and was armed with two single 4.7-in (119-mm) guns.



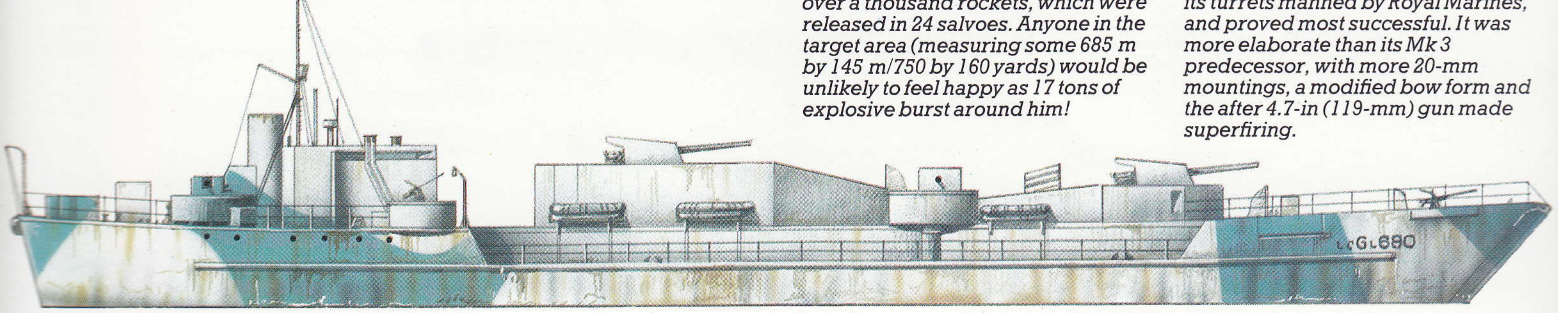
Right: The LCG(M) was specially designed to engage enemy pillboxes, so it carried two turrets with either 17-pdr anti-tank or (as here) 25-pdr guns.



Below: The most spectacular of all the landing craft conversions, the LCT(R) was able to launch 5-in (127-mm) rockets over a two-mile range.

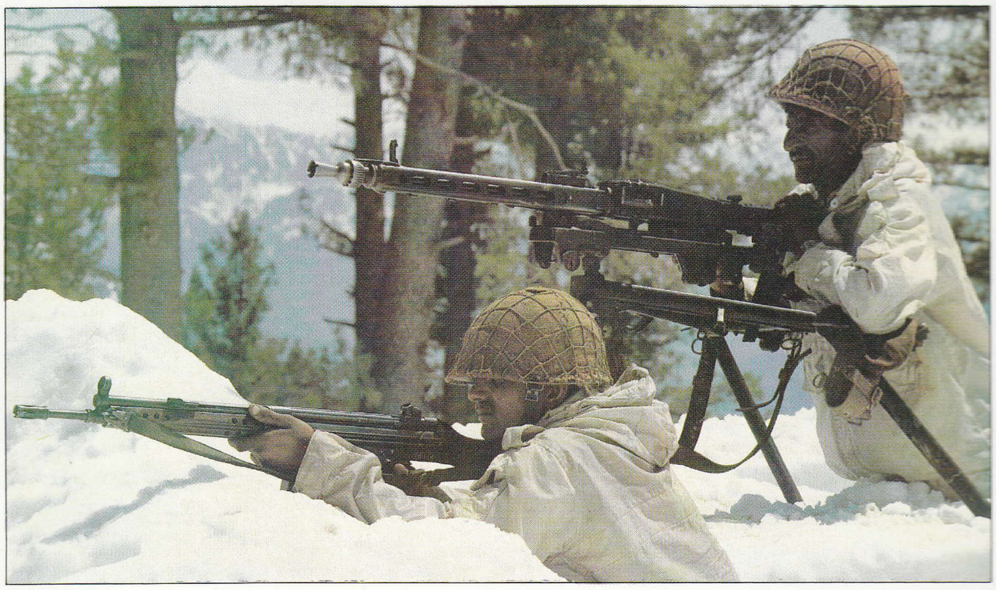


Above: The LCT(R) Mk 3 could carry over a thousand rockets, which were released in 24 salvoes. Anyone in the target area (measuring some 685 m by 145 m/750 by 160 yards) would be unlikely to feel happy as 17 tons of explosive burst around him!



Below: The LCG(L) Mk 4 usually had its turrets manned by Royal Marines, and proved most successful. It was more elaborate than its Mk 3 predecessor, with more 20-mm mountings, a modified bow form and the after 4.7-in (119-mm) gun made superfiring.

Pakistan



Although Pakistan's army remains heavily influenced by British practice, equipment is culled from a wide variety of sources, in this case Germany. The tripod-mounted machine-gun is an MG3, the current German army version of the wartime MG42; the rifle is a Heckler & Koch G3.

The Army

Since 1945 Pakistan has fought three major wars with her eastern neighbour India: in 1948, 1965 and 1971. In the last she lost East Pakistan to form Bangladesh whilst her army suffered defeats on both the eastern and western fronts. The navy fared badly, losing some 22 vessels of all types, though the air force performed reasonably well and came out of the war relatively unscathed after scoring a number of notable victories over its Indian counterpart. Since 1971 the armed forces have concentrated on building up their strength and improving the command and control procedures which caused many of the problems during the last war.

The 320,000-strong army has largely preserved the British legacy of a regimental organization system as the basis of the higher corps, division and brigade formations. Recruitment to all the services is voluntary, and the army HQ is now co-located with those of the navy and air force in the Ministry of Defence in Islamabad.

The major formations of the army comprise:
seven corps HQ (each commanding two or more divisions),
three territorial commands,
two armoured divisions (each with two brigade HQs, five armoured regiments, two mechanized infantry battalions, two self-propelled artillery regiments and supporting units),
16 infantry divisions (each with three infantry brigades, one armoured regiment, one towed artillery regiment, one engineer regiment, one signals battalion and a supply unit),
four independent armoured brigades (each with two armoured regiments, one mechanized infantry battalion, one self-propelled artillery regiment and supporting units),
five independent infantry brigades (each with three infantry battalions, one towed artillery regiment and supporting units),
seven artillery brigades,
two air-defence brigades,
six independent armoured cavalry reconnaissance regiments, and
one special forces group.

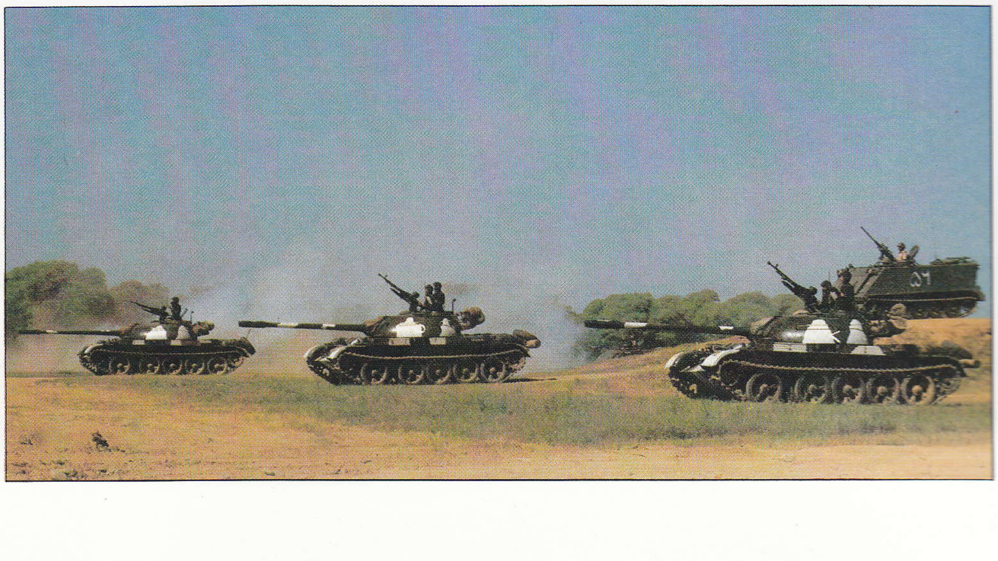
Although classed as regiments, such units are in fact of battalion size, the armoured ones having an HQ section with two tanks and three 12-tank squadrons to give a regimental strength of 38 tanks.

There is also the army aviation wing of one liaison and four helicopter squadrons plus a number of independent observation flights. The fixed-wing units fly some 45 Cessna O-1E Bird Dog and 50 Mashshaq light aircraft and a small number of multi-engine light transport/communications aircraft. The helicopters flown include 16 Soviet Mil Mi-8 'Hips', 35 French-built Aérospatiale SA 330 Pumas and 23 Alouette IIIs, 13 American Bell 47Gs and almost all the 20 Bell Modernized AH-1S Cobra gunships on order.

In terms of equipment the army is a logistical nightmare, major weapons and vehicles having been bought from (amongst others) the USA, the UK, France, Sweden, China and the USSR. As a direct result the indigenous Pakistani arms industry has been restricted largely to the repair and maintenance of the above, plus the manufacture of various small arms, infantry weapons, spare parts and ammunition. However, over the next few years more sophisticated weaponry is to be manufactured, almost certainly as joint projects with Western manufacturers.

The equipment used by the army includes:

armour: M4 Sherman (training), M47M, M48A5, T-54, T-55 and Type 59 MBTs; M24, PT-76 and Type 63 light tanks; M113A1 and Type 531 APCs; UR-416 and Ferret internal security vehicles;
artillery: (towed) 75-mm (2.95-in) M116 and 105-mm (4.13-in) M56 pack howitzers; 85-mm (3.35-in) Type 56, 25-pdr, 100-mm (3.94-in) Type 59, 130-mm (5.1-in) M46, 130-mm Type 59-1, 140-mm (5.5-in) and 155-mm (6.1-in) M59 field guns; 105-mm M101, 122-mm (4.8-in) Type 54, 152-mm (6-in) M1937, 155-mm M114 and 155-mm M198 howitzers;
(self-propelled) 105-mm M7, 155-mm M109A2 and 203-mm (8-in) M110A2 howitzers;
(mortars) 76-mm (3-in) British, 81-mm (3.19-in) M1 and 107-mm (4.2-in) M2/M30 American, and 120-mm Type 53 Chinese;
(rocket launchers) unidentified 122-mm systems;
air-defence weapons: 12.7-mm (0.5-in) M55, 23-mm ZU-23, 37-mm M1939, 37-mm Type 55, 40-mm US M1 Bofors, 40-mm British Mk 1 Bofors, 57-mm S-60, 57-mm Type 59, 90-mm (3.54-in) M117 and 94-mm (3.7-in) guns; Crotale SAM and RBS-70 SAM;
anti-armour weapons: 6-pdr and 17-pdr AT guns; RPG-7, 89-mm (3.5-in) M20 and 83-mm (3.27-in) Blindicide rocket-launchers; 75-mm Type 52 and 106-mm (4.17-in) M40 recoilless rifles; 90-mm M36 and M901 TOW SP systems; and Cobra and TOW ATGWs; and
small-arms: 9-mm Walther P38 pistol; 7.62-mm (0.3-in) G3 and 7.62-mm Type 56 assault rifles; 7.62-mm M1 Garand rifle; 7.62-mm RPD, 7.62-mm MG3 and 7.62-mm Browning Automatic Rifle (BAR) light machine-guns; 7.62-mm Browning M1919 medium machine-gun; and 12.7-mm (0.5-in) Browning M2 heavy machine-guns.



Mainstay of Pakistan's armoured forces is the T-55 and its Chinese version, the T-59, seen here advancing ahead of an American produced M-113. Schemes are afoot to modernize the T-54/5; one option under consideration is to replace the dated D-10T 100-mm gun with a British L7 series 105-mm weapon.

Political friction in Washington has slowed down supply of General Dynamics F-16s to Pakistan, so the burden of air defence still falls on the seven squadrons of Shenyang J-6s (Chinese-built versions of the Soviet MiG-19) armed with AIM-9 Sidewinder air-to-air missiles.

The Air Force

To offset the military imbalance vis-a-vis India, its main adversary, Pakistan needs to develop its own nuclear capability. Thus there is the distinct probability that Pakistan will soon have a nuclear weapons capability to match that of India, which exploded a 15-kiloton atomic bomb in 1974 at a test site only 145 km (90 miles) from the countries' common border. The service tasked to deliver any nuclear weapons would be the Pakistani air force, which flies both Western and Chinese combat aircraft. This 17,600-man force is divided into distinct air-defence and ground-attack units. The most modern element is formed by the two recently-delivered squadrons of air-defence General Dynamics F-16A Fighting Falcon jets, which fly alongside seven relatively old squadrons of Sidewinder-equipped Chinese Shenyang J-6 (MiG-19) 'Farmer' day fighters.

The elderly Martin B-57 Canberra night bomber squadron which saw extensive service in the 1965 and 1971 wars has now been retired, the offensive counter-air and army support role being undertaken by four recently-delivered squadrons of Chinese Nanchang Q-5 'Fantan-A' attack aircraft. Additional Q-5s are believed to be on order to equip a further four squadrons and an OCU. They are backed by a single squadron of Dassault-Breguet Mirage IIIEP fighter-bomber/intruder aircraft and three squadrons of Dassault-Breguet Mirage 5PA ground-attack fighters. The Mirage IIIs can also double in the air-superiority role over the battlefield, using Matra R530 and R550 missiles if required. All the aircraft bar the F-6s and Mirage 5s can be made nuclear-capable with the correct components and suitably qualified technicians. Tactical reconnaissance missions are flown by a specialist squadron equipped with Mirage IIIRP reconnaissance fighters.

Support of the army in the field and the delivery of the special service forces into enemy rear areas is primarily the task of a single squadron of military Lockheed C-130B/Es and an ex-civilian L-100 Hercules transport. Another transport squadron flies a miscellany of aircraft types for VIP missions. There are also two helicopter squadrons which fly small numbers of Kaman HH-43B Husky, Aérospatiale Alouette III and SA 321 Super Frelon types on SAR and utility flights, together with several Bell 47Gs.

Aircrew training is performed by several flight schools and OCUs, which fly both Western and Chinese piston-engine and jet trainer types.

The Navy

Apart from one of the Mirage 5PA squadrons that can be equipped for the maritime strike role with AM.39 Exocet missiles, the navy has to rely on its small air arm for air support. A single maritime patrol squadron flies three ex-French navy Dassault-Breguet Atlantics for ASW and surface-search missions, and another squadron flies six Westland Sea King Mk 45s configured for the anti-shipping role with the AM.39 Exocet. The local SAR undertaking is performed by a squadron of four Alouette IIIs.

The main offensive force of the 11,000-man navy is, however, its force of French-built submarines. This totals two 'Agosta' and four 'Daphné' class boats armed with a variety of French ASW and anti-ship torpedo types and Thomson-CSF ground influence mines. The possibility of fitting subsurface-launched anti-ship missiles to the'Agostas' is being investigated. There are also three Italian SX-404 midget submarines for covert operations.

To replace its war losses and obsolete ex-British ships currently in service, the navy has acquired six American 'Gearing' class destroyers. Although the hulls are 40 years old they have been modernized to the FRAM I standard with an octuple ASROC ASW missile launcher (with 17 missiles), new electronics and two triple Mk 32 ASW torpedo tube systems. The ex-British 'Dido' class cruiser *Jahangir* has now been relegated to the static training and floating AA battery role, sea training duties being taken over by the ex-British 'County' class missile destroyer *Babur*, which is to have her Sea Slug SAM system removed and the helicopter facilities enlarged to take a Sea King. There is also an ex-British 'Battle' class destroyer, the *Badr*, still in service although she will probably be deleted within the next few years because of obsolescence.

The light forces are almost totally Chinese in origin: four 'Hoku' class missile craft fitted with the Chinese version of the 'Styx', four torpedo-armed 'Huchwan' class fast attack craft, four 'Hainan' class ASW patrol boats and 12 'Shanghai II' class gun-armed fast attack craft. There is also a single survivor of the 'Town' class large patrol craft still in service.

The mine warfare forces are now almost non-existent, with only three 1950s designed and built American-aid coastal minesweepers still in service with no replacements in sight. To support the fleet at sea there is the *Dacca*, an ex-American 'Mission' class tanker that has been fitted for underway replenishment, whilst an oceanographic/survey capability has been established recently by the commissioning in 1983 of a Japanese-built survey ship. There are also a number of auxiliaries which include two small dry docks and four tugs.

Sandwiched between the Soviet Union and an opportunist India, Pakistan strives to maintain her independence. Military service is voluntary; like the British army, Pakistan believes a smaller professional force to be far superior to a mass of conscripts. Here, men of the Special Forces Group participate in a Pakistan Day parade.